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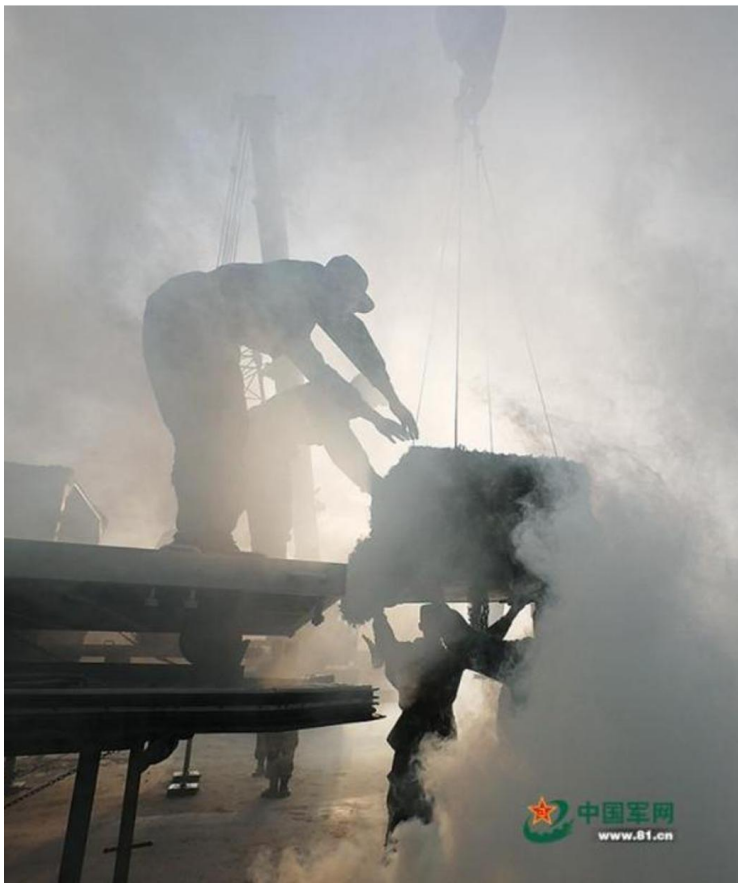
DANCERS AT THE KNIFE'S EDGE: PLA ROCKET FORCE NUCLEAR WARHEAD MANAGEMENT



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INTRODUCTION

The PLA Rocket Force (PLARF), until 2016 known as the PLA Second Artillery Force (PLASAF), is the People's Liberation Army's (PLA) ground-based strategic missile service. It is equipped with a wide range of nuclear and conventional missiles, including short, medium, intermediate, and intercontinental ballistic missiles, cruise missiles, and anti-ship missiles. It has significantly expanded in size and capabilities since being upgraded to a full service in 2015 adding a range of new weapons systems and at least 11 new missile brigades, the majority of which are likely nuclear-capable.[1]

The People's Republic of China (PRC) has been a nuclear power since 1964, when it successfully detonated its first atomic weapon.[2] Since then, the PLASAF/PLARF has served as the PRC's primary nuclear deterrent force. While the PLA has begun building up a credible nuclear triad in recent years, the PLARF and its ground-based nuclear force remain by far the largest and most capable component of that triad.

This report offers insight into the organizations tasked with managing the PLARF's nuclear warhead stockpile. This includes the units responsible for storing, guarding, testing, and transporting the PLARF's warheads. It traces, so far as publicly available sources allow, the journey of these warheads from the central stockpile, buried deep in the Qinling Mountains in Shaanxi, to the PLARF's regional operations Bases, and then on to individual missile brigades and battalions. Where possible, it answers questions about how, where, and by whom warheads are stored: Who is inspecting these warheads? Who is guarding them? Who is moving them from one facility to the next? If an emergency occurs, who responds? In doing so, this report builds upon, and is indebted to, previous work on the topic by Mark Stokes at the Project 2049 Institute.[3]

This research was not at all straightforward, given PLA secrecy, especially toward any matter related to its nuclear capabilities. Even when these units and their mission are obliquely discussed in publicly available sources, they are almost always cloaked in innuendo. For example, PLA sources rarely use the word "warhead" [弹头 or 战斗部]. Rather, they will use euphemisms such as "special equipment" [特装] or "national treasure" [国宝], words which can have multiple meanings based on context. These difficulties were further compounded by a recent crackdown on open sources of information that has intensified in the last two years, forcing researchers to piece together scattered scraps of information to build a cohesive narrative. Details were especially scant at the Base[i] and brigade levels, and virtually nonexistent regarding the PLARF's recent drastic expansion of silo-based ICBMs, leaving a number of unsatisfying gaps in the research.

Even so, this report shines new light on how the PLARF manages its nuclear stockpile. It begins by discussing the central stockpile outside Baoji, known as "Hongchuan" describing the storage and testing of the warheads. It then discusses the various support units which ensure that the warheads are safely stored and regularly tested, properly guarded by air defense, electronic countermeasures, and physical security, and transported by road, rail, or air. It also looks at which

[i] The PLA uses the term "Base" to mean two different things. CASI uses a lower case 'b' for 'base' when the PLA refers to a physical military location, and the capital "B" for "Base" to refer to a standing organizational structure, typically at the Corps level, which may include one or multiple 'bases'.

units would communicate with other PLARF units and respond to a nuclear or radiological incident. Finally, the report examines how warheads would be stored and tested after they are transported to the PLARF's operations Bases, as well as how they are then transported to each of the Base's nuclear brigades for final launch.

BASE 67 AND THE CENTRAL STOCKPILE

Below the Headquarters level, the PLARF is organized into nine Corps Leader or Corps Deputy Leader-grade Bases. These include six operations Bases (Bases 61-66) spread across the PRC, each with a unique number and mixture of nuclear and conventional missile brigades according to its mission, as well as three Bases (Bases 67-69) tasked with various support missions. The first of these, Base 67, is a Corps Deputy Leader-grade Base tasked with all management of the PLARF's nuclear stockpile, including secure storage, testing, defense, and transport of warheads.[4]

Base 67 was originally established as Unit 0674 in 1958, reporting directly to the Central Military Commission (CMC). It was moved to Shaanxi in 1969, and transferred to the PLA Second Artillery Force in 1980.[5] Previously known as Base 22, it received its current name as part of a 2017 PLARF reorganization. Its main headquarters are located in Baoji City in Shaanxi Province.

Today, Base 67 likely oversees at least three brigade-sized units, two of which are tasked with warhead storage and testing and one with nuclear emergency response, as well as eight regiment-sized units tasked with various support missions, including training, communications, security, logistics, air defense, electronic countermeasures (ECM), warhead quality control, and warhead transport. Most, but not all, of these units are scattered in and around Baoji and the nearby Qinling Mountains. All Base personnel are given the unofficial moniker of "Guardians of the National Treasure" due to their role in safeguarding the PRC's warhead stockpile.

Table 1: Base 67 Units

Unit	MUCD	Grade	HQ Location	HQ Coordinates	Mission
Base 67	96607	Corps Dep	Baoji, Shaanxi	34.348958, 107.160065	Stockpile Management
Technical Service Brigade	96037	Div Dep	Baoji, Shaanxi	34.05527, 107.32508 33.863638, 107.246776	Storage, testing, transport
U/I Unit	96038	Div Dep	Luzhou, Sichuan	28.838747, 105.418284	Testing
Emergency Management Group	96771	Div Dep	Baoji, Shaanxi	34.056190, 107.326841	Emergency response
Training Regiment	96871	Reg	Baoji, Shaanxi	34.053425, 107.327487	Training
Comms Regiment	96872	Reg	Baoji, Shaanxi	34.349052, 107.162293	Communications
Operations Support Regiment	96873	Reg	Baoji, Shaanxi	34.350450, 107.160357	Engineering, security, NBC defense, etc.
Comprehensive Support Regiment	96874	Reg	Baoji, Shaanxi	34.349880, 107.272280	Logistics, repair & maintenance
Air Defense Regiment	96875	Reg	Baoji, Shaanxi	Unknown	Air defense
2nd Comprehensive Defense Regiment	96876	Reg	Nanchang, Jiangxi Baoji, Shaanxi	Unknown	ECM, signals, comms support, radar surveillance
Equipment Inspection Institute	96877	Reg Dep	Baoji, Shaanxi	34.348850, 107.270698 33.884842, 107.278483	Warhead quality control, telemetry, research
Special Equipment Transport Regiment	96878	Reg	Longnan, Gansu	33.826494, 106.419984 (unconfirmed)	Transport

WARHEAD STORAGE AND TESTING

Hongchuan and the Technical Service Brigade

The primary storage complex for PLARF warheads is known as "Hongchuan," which literally translates as "Red River."[6] Located deep in the Qinling Mountains roughly 35 miles from Base 67 HQ in Baoji, and apparently accessible only by a single narrow mountain road, the string of above ground and underground facilities are extremely remote; as of 2019, it had no cell coverage or convenient access to internet outside the facility computer room.[7,ii]

Image 1. Road leading in and out of Hongchuan. Source: Tencent

Traditionally, Hongchuan's remoteness has become part of the legend PLA media propagates around it. It has attempted to compensate for its difficult conditions and the likely ensuing issues with personnel quality of life and retention by instilling a strong *esprit de corps,* urging personnel to exhibit "Hongchuan Spirit" and frequently praising their fortitude and sense of duty.[8] The small number of women at Hongchuan, who were first allowed in 2014 and mostly appear to staff its communications, are praised as the "Mulans of Hongchuan."[9]

The Hongchuan facility is managed by the Base 67 Technical Service Brigade. The brigade's responsibilities include secure storage and handling, testing, security, and road transport.[10] Warhead storage and testing is primarily carried out by the brigade's Storage

[ii] A second associated facility, known as Hongling [红岭], is much less well attested, but may be a command post for Base 67 located closer to the Base HQ in Taibai County.

Management Battalion. On-site testing includes precision measurement of temperature and humidity (to .01 in their respective units of measurement) in warhead storage areas.[11] The battalion also handles transfer of warheads to other Base 67 testing sites.[12] Beginning around 2015, the brigade began improving its storage facilities, including better standardization and containerization of materials in response to problems with disorderly and non-standardized storage.[13]

In addition, the brigade commands a road transport battalion, known as the 70th Subunit, which also likely facilitates transport to testing sites outside Hongchuan, as well as to Operations Bases (see "Road Transport" below).[14] Other subordinate elements include a Site Management Battalion responsible for facility management,[15] a Communications Battalion,[16] and battalions for operations support[17] and "comprehensive" (logistical) support.[18,iii]

The Technical Service Brigade was recently upgraded from a regiment in 2017, following a significant reorganization which saw numerous elements which were previously directly subordinate to Base 67 placed under its command. As part of a push to move Second Artillery units out of remote mountain locations and into cities to improve their quality of life,[19] many personnel posted at the remote and difficult Hongchuan facility had been moved to urban facilities in Baoji by the early 1990s.[20] However, in 2017, the PLARF decided to move many of these personnel back to the Hongchuan garrison, in an apparent effort to consolidate forces and place personnel closer to the "first line."[21] Thus, many (although apparently not all) brigade personnel were moved out of the Baoji HQ and into the Hongchuan mountain facility.[22] In addition, several disparate Base 67 elements were consolidated under this brigade, including the Equipment Inspection Institute, which was downgraded to Regiment Deputy grade (see "Equipment Inspection Institute" below). Over 300 Institute personnel, including 46 senior engineers, were transferred to Hongchuan beginning in March 2017.[23] The brigade also took command of Base 67's road transport battalion, previously under the command of the Base's transport regiment; it is now known as the 70th Subunit.[24] Finally, almost one-third of Base 67's ECM regiment was also transferred to Hongchuan at that time.[25]

Based upon the significant amount of ink spilled in PLA media praising model personnel who dutifully moved to Hongchuan in 2017 without complaint, it is reasonable to infer that this action did in fact lead to complaints from personnel, who saw significant downgrades in quality of life and could no longer live with or even easily communicate with loved ones. Some evidence suggests the move was not well planned or effectively communicated to personnel; per one source, some personnel were given less than one week's notice of their transfer and had to scramble to make plans for their children.[26]

Equipment Inspection Institute

The aforementioned Equipment Inspection Institute, placed under the Technical Service Brigade in 2017 and reduced from a Division Leader grade to a Regiment Deputy Leader grade,[27,iv] is tasked with dual missions of scientific research and warhead quality control and checkout.[28] It

[iii] Operations support elements typically handle security, engineering, NBC defense, meteorology, survey and mapping, and related support missions. Comprehensive support units typically handle logistics and repair and maintenance of unit equipment.

[iv] Following this downgrade, this unit may now also be referred to as an "Equipment Inspection Station" [装检站], per one source.

is responsible for overall quality control of warheads and their storage environment, ensuring warhead safety and reliability in long-term storage.[29] It tests weapons systems and components,[30] conducts regular monitoring and repairs, provides environmental monitoring and structural analysis of storage facilities,[31] and supports missile and warhead lifespan extension and renovations.[32] Sources repeatedly emphasize the Institute's focus on ensuring the reliability of "core components,"[33] although it is unclear if this, like "National Treasure," is an oblique reference to the warhead itself or more specifically to the warhead core. In these missions, the Institute is likely supported by the 3rd Academy of the PLARF Research Academy, also known as the Institute of Nuclear Technology, which is focused on research into nuclear storage and safe handling, radiation detection and protection, and waste disposal.

As part of its dual mandate, the Institute also conducts supporting research, including providing telemetry and tracking support for launches, with its own dedicated telemetry subunit.[34] Another major research focus appears to be missile usage and applications,[35] including on developing best practices for newly introduced missile systems. Per one source, in 2009 a new missile system[v] was limited by problems with quality control and operational applications. A team from this Institute spent five years improving quality control and optimizing its operational effectiveness.[36]

Institute personnel are reportedly particularly well educated, given their mission; a source from 2006 claims that half of the unit's scientific and technical cadres possess master's or doctoral degrees,[37] and almost 20 personnel are sent each year for external training at leading factories, research institutes, and universities such as Tsinghua or Zhejiang University.[38] This fact adds a further interesting wrinkle to the unit's 2017 move to Hongchuan; given the unit's need for educated personnel, as well as the PLA's push to improve quality of life in order to recruit personnel with advanced degrees, it is unclear how many of these highly sought-after personnel are willing to accept the significant downgrade in quality of life the move to Hongchuan represents. Such a job requires living rough in the mountains, away from family and the comforts of city life, with no cell coverage and limited internet, doing a potentially very dangerous job for likely less pay than they could command in the private sector. PLA media never directly addresses this, but the numerous stories it has published about technical personnel who have pointedly rejected comfort and family in the name of duty indicates that it is something the PLA is concerned with.

Unit 96038

The third and final unit concerned with warhead storage and testing is identified only by its Military Unit Cover Designator (MUCD) of 96038; its official name is otherwise unknown. Its main headquarters are in Luzhou, Sichuan Province, several hundred miles south of Base 67 HQ in Baoji. It appears to be a Division Deputy Leader-grade organization,[39] but sources otherwise conflict as to its actual organization. Sources from 2016 indicate it is organized either as a brigade[40] or as a *dadui*, or "group."[41] A more recent (c. 2021) source indicates that it may be organized as a *zongdui*, with at least nine subordinate *dui*, or "teams."[42]

Much like the Technical Service Brigade at Hongchuan, this unit's missions appear to include warhead management,[43] inspection,[44] security,[45] and transport.[46] It could be a secondary

[v] Given the timeframe, possibly the DF-16 or DF-31A.

facility for storage and inspection. Alternatively, its mission could be complementary to Hongchuan's, with an increased focus on testing, inspection, and repair of warheads or certain warhead components.[47] It oversees at least one "Special Equipment Station"[48] for equipment inspection and testing.

The unit also appears to have a training mission, with a subordinate "Missile Simulation Training Center" capable of simulating different types of missiles and their components.[49] Other subordinate elements include a Repair Battalion,[50] a Security Battalion, including a 38-man "Sharp Knife" Special Operations Team[51] and a company known as the "Guardian Spirits of the Restricted Zone,"[52] and a Transport Battalion.[53] The latter is tasked with armed escort of the "National Treasure,"[54] via road and possibly rail.[55]

SECURITY AND DEFENSE

Air Defense

In 2012, Base 67 added a dedicated unit for air and missile defense of its stockpile.[56] Beginning as an experimental test team,[57] it was upgraded to a full regiment in 2017.[58]

While little has been written about the unit or its operations, it appears to be equipped with an unknown number of HQ-11 or HQ-16 SAM batteries,[59] as well as the LD-2000 CIWS for point defense.[60] It includes at least one (possibly more) mobile launch battalion,[61] as well as an electronic countermeasures battalion.[62]

For the six years following its formation in 2012, the regiment's known launch battalion took part in five major missions, launching 32 missiles and hitting their targets 15 times, which was described as a "historic breakthrough" for the PLASAF/PLARF.[63] It has also taken part in Red-Blue OPFOR drills.[64] It has apparently improved over time. In an early exercise, it failed to intercept an enemy aircraft that used the local geography to slip through,[65] and in the unit's first major exercise as a full regiment in September 2017, its tracking and jamming success rates were considered unacceptable, at 40 percent and 33 percent, respectively. By 2018, these figures have reportedly improved to 80 percent and 100 percent.[66]

Image 2. 1st Launch Company of the PLARF Air Defense Regiment. Source: 81.cn

One interesting aspect of this regiment is its highly mobile nature. With a slogan of "Go anywhere, win everywhere," [67] it has been noted traveling long distances and conducting drills in varied environments different from the mountainous landscape around Hongchuan, including in Inner Mongolia.[68] This may indicate that the regiment's mission includes not only defense of Hongchuan, but other key sites such as storage depots and transport nodes, or possibly the warheads themselves in transit. The apparent small size of the unit calls into question how many sites it would be able to defend without stretching itself excessively thin, however.

Electronic Countermeasures (ECM)

In addition to its air defense regiment, which includes an ECM battalion, Base 67 also commands a dedicated ECM and electromagnetic (EM) support regiment, which some sources refer to as the 2nd Comprehensive Defense Regiment.[69,vi] It is tasked with jamming enemy radars, weapons, and communications; counter-jamming; radar surveillance and detection of enemy aircraft and missiles; mobile communications support; and electronic reconnaissance in defense of the "National Treasure."[70]

Per one source, regiment elements are widely dispersed across multiple provinces, likely providing support to other facilities.[71] Previously stationed primarily in Nanchang, Jiangxi Province, far from Base 67 in Baoji, the regiment was reorganized in April 2017, with many of its personnel transferred to Hongchuan (see above).[72] Nearly one-third of the regiment's personnel were also transferred to a brother unit, a likely reference to the newly formed air defense regiment, which formed at this time and includes an ECM component. Concurrently, its mission

[vi] Another ECM regiment, presumably the 1st Comprehensive Defense Regiment, is directly subordinate to the PLARF Staff Department and likely tasked with defense of PLARF HQ.

requirements expanded, possibly a reference to the regiment's current role as more of a general EM support unit. In 2018, it received new equipment for its new mission and successfully deployed that equipment in an OPFOR drill six months later. By 2021, it had filled all new key billets, and over two-thirds of operators are able to be used in multiple billets.[73]

The regiment is capable of establishing ad hoc, modular formations, adding and subtracting fire, reconnaissance, communications, and maintenance subunits as needed.[74] It possesses "fire intercept equipment," and in 2020 began employing a new "1+2" three-vehicle collective fire combat method, which significantly increased its fire coverage.[75]

Site Security

Unsurprisingly, all Base 67 facilities place strong emphasis on physical security, with most units commanding dedicated security battalions. Many units also employ smaller tactical teams to defend both their facilities and any nuclear cargo they transport from ground attack. Base 67 HQ is guarded in part by a "Knife Edge" Special Operations Team,[76] while Unit 96038 is guarded by both a security battalion and a 38-man "Sharp Knife" Special Operations Team.[77] The Base's air defense and ECM regiments also both command their own security battalions.[78]

While there is little information about security arrangements of the main stockpile at Hongchuan, one source vaguely suggests that facility security may be split between an outer security subunit and inner "missile and weaponry technical security personnel," possibly a specialized security force with additional training tasked with guarding the stockpile itself.[79]

PLARF operations Bases also possess dedicated subunits for warhead security. Based on available information, these are surprisingly small, in comparison to the battalions available at the central stockpile. At least some Base equipment inspection units, responsible for warhead management at the Base level (see "Warhead Storage and Inspection" below), do not command dedicated security battalions or even companies, but rely on multi-mission "security and communications" companies. Security elements cooperate with local police and village Party Committees, employing local civilian and police patrols as force multipliers around the facility's perimeter. These civilian elements report to the unit's Political Work Department.[80]

At least two Bases appear to employ larger security forces. The Base 66 Equipment Inspection Regiment employs both a site security company[81] and a security and communications company, which is known as the "Iron River Warrior Company."[82] The larger Base 64 Equipment Inspection Brigade commands a dedicated security battalion,[83] likely because of its larger size and the vast distances it must patrol, with barriers between the core facility and the outer security perimeter of several hundred kilometers.[84] This brigade is notable for the remote and harsh plateau geography it must contend with, including average elevations of 3,300 meters or more.[85] The battalion's personnel are spread out over this terrain between at least 11 remote outposts.[86] The 9th Outpost, at 3,600 meters above sea level, is manned by only six personnel and must patrol 32 square kilometers of restricted terrain.[87,vii] To navigate the rough terrain, at least one security company is trained for patrol and combat on horseback.[88]

[vii] Notably, sources state that this outpost has produced three future PLA Generals since its establishment in 1960.

Equipment inspection units have worked to improve their stockpiles' survivability via upgraded camouflage, anti-satellite defenses, and underground command systems.[89] Interestingly, however, at least one Base equipment inspection unit appeared to be employing an outdated computer operating system as of 2020, suggesting possible cybersecurity vulnerabilities.[90]

Image 3. Base 64 Warhead Security Company training. Source: China.com.cn

OTHER SUPPORT MISSIONS

Communications

Base 67 and the Hongchuan complex are supported by a Communications Regiment, which maintains communications channels between Base command elements and subordinate units, as well as, presumably, Base 67, the various Operations Bases to which it supplies with warheads, and PLARF HQ in Beijing. This regiment is likely made up of three or four communications battalions, each with two companies. One of these is a mobile communications battalion.[91] This mobile battalion is capable of erecting field communications hubs in the face of enemy airstrikes, jamming, and special operations ground attacks.[92]

Field communications methods include satellite,[93] microwave,[94] and likely troposcatter systems.[95] Videos also show communications personnel sending encrypted morse code.[96] At the headquarters level, Base 67, Hongchuan, and other affiliated units communicate through an extensive fiber optic cable network. For example, in 2019 Unit 96038 built over 20 miles of cable,

likely from its HQ in Maliuwan to the more remote Xinmiao Village, suggesting possible storage or testing facilities in that area.[97] In 2021, the Base 67 Communications Regiment proposed the creation of a large 42,000 square meter fiber optic training ground to train personnel in cable laying, maintenance, testing, troubleshooting, and repair of underground and above ground cables.[98] It is unclear if this training ground has been built as of the time of writing.

Image 4. Base 67 Mobile Comms Drill. Sources: CCTV, China Military Online

The PLARF's extensive network of fiber optic cables, including those of its warhead storage and transport system, are continuously being built out by the Base 68 Communications Engineering Regiment (MUCD 96885). With at least eight subordinate construction companies, this regiment laid down over 200 kilometers of cables in 2019. The Base 68 Engineering Maintenance Support Group (MUCD 96886) provides maintenance and repair support for this infrastructure.[99]

Emergency Response

In the event of a chemical, biological, radiological, or nuclear (CBRN) incident, Base 67 commands a dedicated emergency response unit called the PLARF Emergency Management Group. Missions include sealing off and controlling the affected area, containing the spread of radiation or other harmful substances, decontamination and waste disposal, and search and rescue.[100] The unit drills frequently with hospitals in nuclear incident response,[101] but is also capable of responding to other disasters, such as chemical leaks or spills.[102]

The unit was established in 2008,[103] and was soon after put to work providing disaster relief and pandemic prevention support following the Sichuan Earthquake.[104] It was named as a National nuclear, biological, and chemical (NBC) Emergency Assistance Team in 2015,[105] and in 2016 it was made part of a larger coordinated national nuclear response network called the China Nuclear Emergency Rescue Team. This Team is made up of 25 individual military and civilian emergency

response teams, and is intended to coordinate their efforts, primarily to meet the demands of the PRC's growing nuclear industry.[106,viii]

Image 5. Decontamination drill. Source: CCTV

In 2018, this unit was reformed into a brigade, with new equipment and an expanded mission.[107] It possesses UAVs and nuclear contamination detection vehicles, contaminant suppression vehicles, containment vehicles, search and rescue vehicles, a battalion command vehicle, and other support vehicles.[108] It appears to be equipped with state-of-the-art foreign robotic systems for stand-off obstacle clearance, waste detection, disposal, and decontamination.[109] Personnel require one to two years of training to be able to independently operate nuclear waste disposal robots.[110]

One interesting characteristic of this unit, as well as other PLARF nuclear-handling elements such as equipment inspection units, is an extensive reliance on foreign equipment for dealing with nuclear materials. This includes not only high-tech equipment, such as large robots which would allow PLARF units to more quickly clear and repair obstacles to transport, but also low-tech equipment, such as basic personal protective equipment (PPE). At least some of this equipment is likely export controlled.

Table 2: Foreign Nuclear Handling and Emergency Equipment Used by the PLARF

Company	Country of Origin	Product
Radiation Shield Technologies	USA	Demron-brand hazmat suits,[111] face masks, respirators[112]
Dupont	USA	Tychem-brand hazmat suits[113]
Kappler	USA	Z500 hazmat suits[114]
Honeywell	USA	PPE gloves[115]
3M	USA	Face masks, respirators, oxygen tanks[116]
Brokk	SWE	Brokk100 remote demolition robot[117,ix]
Kinshofer	GER	Robotic grappler[118]
Drager	GER	Hazmat suits[119]
Nuviatech	FRA	CoMo-170 handheld radiation sensors[120]
Leader Group	FRA	Hasty-brand remote SAR equipment[121]

[viii] Although left unsaid in public press releases, the team is also likely meant to address the PRC's growing military arsenal as well.
[ix] Acquired via local subsidiary in Beijing.

Image 6. Nuclear disposal and obstacle clearance equipment from Swedish company Brokk. Source: CCTV

Logistics and Operations Support

The Base 67 Comprehensive Support Regiment handles Base logistical support, repair, and maintenance, having been formed in 2017 by combining multiple logistical subunits with the Base repair factory.[122] It oversees numerous depots for fuel, munitions, and materiel,[123] and in line with Military-Civil Fusion efforts, can receive further support from local civilian repair factories, gas stations, and hospitals in wartime.[124] In addition to vehicle and equipment repair, storage, and transport, it also oversees logistical necessities such as culinary and medical support.[125]

Further support is provided by the Base 67 Operations Support Regiment, most notably in providing the main security and defense force for Base HQ (see "Site Security" above). It also provides engineering and construction support, NBC defense, meteorology, and survey and mapping support.

Warhead Transport to Operations Bases

Base 67 transports its store of warheads via at least two units. Rail transport is overseen by the Special Equipment Transport Regiment, while road transport is directly overseen by the Technical Service Brigade at Hongchuan. A basic air transport capacity also exists, although very little information is publicly available about this capability.

Rail Transport

The Special Equipment Transport Regiment, established in 1981,[126] likely oversees two rail transport battalions[127] for transporting warheads to Operations Bases.[128] This regiment previously commanded a road transport battalion as well, but that battalion is now apparently under

the direct control of the Technical Service Brigade. Thus, some sources now refer to it as the Rail Special Transport Regiment,[129] although it is unclear if this is now its official name.

The regiment may have its HQ in Taibai, but its rail assets are heavily concentrated around Xipo Township in Liangdang County, Gansu Province (roughly 50 miles west of Hongchuan).[130] Rail journeys, which can last several days, involve strict temperature and humidity control, which are tested every 1-2 hours.[131] To avoid accidents due to rail malfunction, the trains are inspected continuously throughout the journey at every stop.[132] The experience of one veteran personnel, who conducted nearly 100 such rides over a 30 year career, suggests that personnel can expect to conduct roughly 3-4 such missions per year.[133]

Image 7. Rail transport cars at an intermediary station. Source: CCTV

Rail transport missions are supported by PLA Military Representatives (MR) who are present at all train stops, government bureaus, and rail company offices along the route, planning and organizing military transport.[134] These MRs oversee loading, unloading, storage, and timely dispatch of all military cargoes along their area of responsibility. For example, one MR under a rail company oversees loading, unloading, and dispatch along 2,000 kilometers of railway.[135] MRs also ensure that PLARF escort personnel are supplied with food and other supplies and facilities along the route.[136] PLARF units are supplied with a book containing the names and contact info of all MRs, which they use to contact the MRs along the route to notify them of their plans and coordinate logistics.[137] Today, these MRs primarily appear to be under the PLA Joint Logistics Support Force, which aids with the logistical requirements of the PLA services.[138]

Road Transport

Previously subordinate to the Special Equipment Transport Regiment, Base 67's road transport battalion is now directly subordinate to the Technical Service Brigade, likely as part of the recent reforms which saw multiple Base 67 elements consolidated at Hongchuan. Today, the

battalion is known as the 70th Subunit. Between its establishment in 1981 and 2021, the battalion conducted over 800 transport missions and traveled over 40,000 kilometers.[139]

Warheads are transported in "special vehicles," with thermal camouflage and likely other modifications. Convoys can be made up of over 40 vehicles,[140,x] led by a lead command vehicle.[141] Drivers receive training in precision driving, including being able to turn the vehicle around within a space only one meter longer than the body of the vehicle, reverse within a 500-meter narrow pit that is only 200 millimeters wider than the front of the vehicle, and pick up small glass bottles with a hoisting crane.[142]

Prior to each mission, personnel are cut off from contact with family for security purposes for an unknown period of time. Battalion convoys can receive police escorts and are trained to transport warheads through a degraded wartime environment and destroyed infrastructure. Personnel can rapidly repair damaged vehicles and roads[143] and set up pontoon bridges.[144] If a vehicle is damaged beyond repair, warheads can be hoisted and moved to a backup vehicle in under ten minutes.[145] Personnel are also trained to withstand chemical attacks and radiological environments,[146] as well as defend against air attacks and ground attacks from enemy special operations forces.[147] Warheads and the environmental conditions in the trucks are checked every two hours.[148] The trucks are able to stop at preset rest stops during the day, which are covered by camouflage. Contextually, some of these stops may be located within cities or smaller settlements, as one anecdote describes personnel as tempted by vendors hawking food nearby, but unable to leave their vehicles in the daytime.[149,xi]

The battalion has at least one special highway for its own use, built around 2007 as part of a national defense highway project. This is a Level II, load-bearing highway of 22.4 kilometers linking the Base 67 rail hub in Liangdang County (see above) with an eastern terminal at Wenjiangsi in Feng County, Shaanxi Province.[150] It is likely that the battalion possesses multiple such special highways.

[x] Note: This source is over 20 years old, and it is possible convoys have since shrunk with improved technology.

[xi] In the PLA media tradition of emphasizing struggle and sacrifice in the name of duty, another implausible anecdote describes one of the men observing his wife emerging from a hospital but being unable to leave his hideout to help her.

Image 8. Transport vehicles with IR-masking covers. Source: CCTV

Image 9. Transport convoy. Source: CCTV

Image 10. Convoy command vehicle. Source: CCTV

Image 11. Transfer of nuclear cargo via crane. Source: CCTV

Image 12. Emergency pontoon bridge construction. Source: CCTV

Image 13. Convoy driver training. Source: Tencent

Air Transport

While the PLARF does appear to have a basic air transport capability, very little information has been publicly revealed about this. The Special Equipment Transport Regiment first successfully transported an unknown number of warheads by air in 1986, flying its payload to a destination 2,600 kilometers away.[151] The regiment may command a dedicated air transport subunit which ensures a stable cabin environment.[152]

It is unknown whether air transport missions are carried out by pilots under the PLARF, or whether this is an example of joint force cooperation. Given the fact that the PLARF has gone so far as to create its own air defense regiment from scratch rather than rely on more experienced PLAAF or PLAA air defense units to guard Hongchuan, it is difficult to imagine the PLARF handing over its "National Treasure" to the care of another service for transport. However, no evidence of an independent PLARF air capability has ever emerged, and such a capability would be difficult to build up and support, so it is more likely that PLARF personnel of the air transport subunit would ensure safety and monitor the cabin environment while on board PLAAF planes used for transport. This option would likely only be used as a last resort.

Two airfields relatively near Hongchuan, both roughly a four-hour drive north, may present the most attractive options for airlifting. The first is a PLAAF airbase hosting elements of the 107th Bomber Regiment at 34°16'20"N 108°15'58"E,[153] while the other is a former PLAAF airbase at 34°31'54.1"N 107°28'19.2"E. The latter is currently being redeveloped and significantly expanded as part of a joint Military-Civil Fusion project,[154] which will primarily be used as a civilian airport for the city of Baoji.[155]

At some unknown point prior to 2009, the Second Artillery Force also experimented with transporting missiles by air, conducting an experimental flight with an unknown number of reportedly live missiles and recording data on how tilt, bumps, displacement, and other factors affected the missile(s) in flight. The experiment was notable for the fact that it almost ended in disaster; having somehow run out of fuel and unable to travel to a backup airfield, the flight was forced to make a dangerous landing in foggy conditions with its missile payload.[156] Sources describing the event give no further details on the type or number of missiles on board.

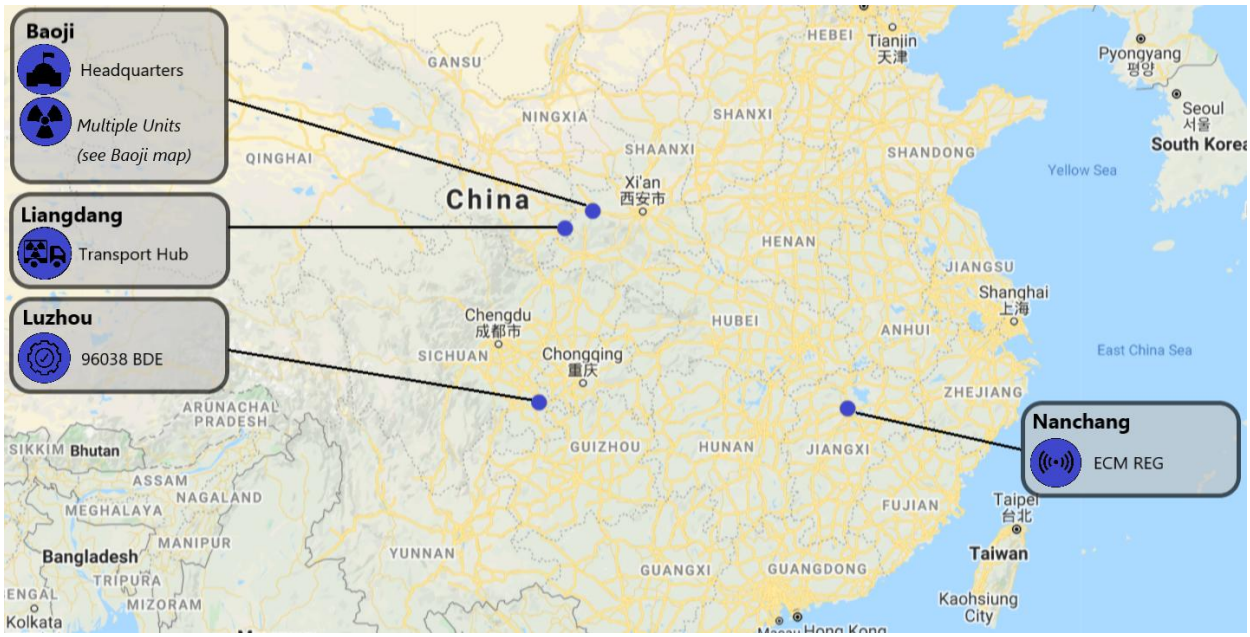

Image 14. Map of Base 67 units. Note that significant parts of the ECM Regiment have been reassigned to the Hongchuan facility.

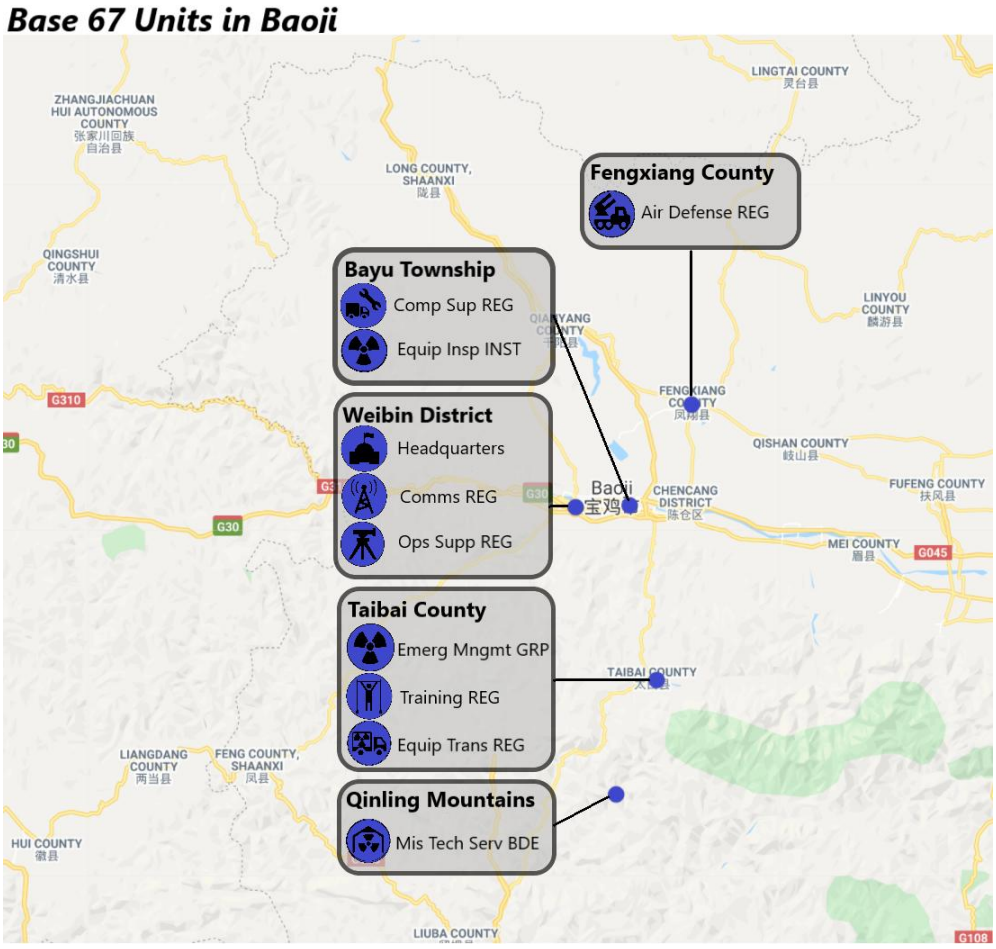

Image 15. Map of Base 67 units in and around Baoji City. Note that significant elements of the Equipment Inspection Institute and Transport Regiment have been reassigned to the Hongchuan facility.

BASE-LEVEL WARHEAD MANAGEMENT

WARHEAD STORAGE AND TESTING

Once warheads have been transported from the central stockpile to the six Operations Bases, they are primarily the responsibility of each Base's equipment inspection unit. These are regiments for five of the six Bases; the Base 64 Equipment Inspection Regiment has been converted to a brigade, possibly around 2015.

One source poetically describes the mission of equipment inspection units as "dancers at the knife's edge" of the PRC's strategic missile deterrent.[157] More prosaically, equipment inspection units are responsible for warhead storage, management, and inspection at the Base level,[158] and may have a limited transport mission as well (see "Warhead Transport to Missile Brigades" below).[159] In 2017, sources began indicating an expansion of mission, described as a switch from simple equipment inspection to "equipment inspection operations."[160] This may have included closer work supporting missile units, with more trans-regional deployments to participate in launch drills, more training in complex and realistic environments, and improved testing and transport capabilities.[161]

While unit headquarters are typically located in or near an urban environment, warhead storage facilities are located in remote environments, often dug into mountains.[162] One unit's storage facility is located over 200 kilometers from the city; prior to the construction of a highway network after 2007, this drive took nearly six hours, but has now been reduced significantly.[163] Storage, testing, and safety is managed by a technical service battalion,[164] while facilities are managed by site management companies which can be stationed in these remote locations, often underground, for up to six months.[165] Personnel stationed at these facilities are only able to see their families on a limited number of weekends.[166]

As with the central facility at Hongchuan, storage conditions are exacting and constantly monitored for temperature, humidity, and safety.[167] Every surface is cleaned regularly (although one source describing the cleaning mentions black spots on the wall and dust on some surfaces, indicating some length of time between cleanings) and data on wind, water, and electrical power in the facility is constantly monitored.[168] However, in its effort to emphasize the dedication of the personnel who work at the facility, sources inadvertently suggest serious safety deficiencies: in one bizarre anecdote, work at a Base stockpile site whipped up "many years" of radioactive dust into the air. Contact with this dust resulted in severe acute dermatitis symptoms amongst personnel,[169] suggesting a lack of adequate PPE (to say nothing of the fact that this dust was both radioactive in the first place and apparently sitting uncleaned for years).[xii] In another article, the same man caught in the dust described the chronic health conditions he has suffered as a result of his 22 years at the storage facility, including low white blood cell counts, irregular heartbeat, chronic vision and digestive issues, and arthritis.[170]

[xii] Based on the date of the article and the 22-year career length of the NCO relating this anecdote, this event could have taken place at any point between 1996 and 2018. It is possible that this incident occurred at a more "primitive" stage in the PLA's development in the 1990s or 2000s, and safety has since improved, but this is not stated one way or the other.

Equipment inspection units also oversee at least three battalion-grade equipment inspection stations.[171] These stations provide inspection and checkout of missile systems prior to transport to missile brigades. While few details were found on inspection, it is reportedly a multi-day affair: at one point, a station managed to reduce the amount of time needed for inspection by two days.[172]

These stations are located outside of urban areas[173] and may be located close to one another, as they drill to be able to quickly transfer personnel from one station to another in the event of casualties.[174] Prior to 2016, each station would typically be responsible for inspection/checkout of a single missile system, but worries about vulnerabilities if one station was rendered inoperable have led to an emphasis on cross-training and each station being able to handle multiple missile systems.[175] The stations also previously relied on civilian factory personnel to support inspections, but have worked toward being able to operate independently without factory support.[176]

It appears that equipment inspection units work not only with warheads, but with the missile bodies as well. Units are proficient in "whole course missile testing."[177] Other sources described them testing and measuring missile body and fuel parameters and supporting missile life extension.[178] Inspection personnel will also travel to provide close support to missile brigades.[179] The division of labor between on-site equipment inspection elements and brigade technical battalions which are responsible for pre-launch testing (see "Brigade-Level Warhead Management" below) is unclear.

央视透露的中国二炮东风-31洲际导弹的弹头部分

Image 16. Base personnel inspect a DF-31 warhead. Source: iFeng

Unique among the equipment inspection units, Base 64 oversees an Equipment Inspection Brigade. Established in 1958 as Unit 8122,[180] it pre-dates the Second Artillery Force and harkens to the earliest days of the PRC's nuclear program, when it served as the PLA's first nuclear storage facility.[181] The brigade is notable for its remote and harsh plateau geography; average elevations are approximately 3,300 meters above sea level.[182] Satellite imagery shows multiple remote

security outposts surrounding a complex with possible underground facilities for warhead storage.[183,xiii]

While equipment inspection units store warheads for the six Operations Bases, no information has yet emerged on storage for the PLARF's new silo fields, first spotted by Western observers in 2021.[184] Notably, the Base 64 Equipment Inspection Brigade is the closest known storage facility to two of the three silos, and was upgraded to a brigade in the years prior to their construction. While any connections between these sites are purely speculative, storing and testing silo warheads at this location would roughly halve the distance they would need to travel compared to storing them at Hongchuan, significantly reducing both wartime exposure to strikes and peacetime transport risks, as well as improving the speed and efficiency at which these warheads could be deployed.

Table 3: Base Equipment Inspection Units

Base	MUCD	Grade	HQ Location	Geocoordinates
Base 61	96031	Reg	Jingdezhen, Jiangxi	29.316406, 117.268020
Base 62	96032	Reg	Mile, Yunnan	Possibly 24.399054, 103.432068
Base 63	96033	Reg	Huaihua, Hunan	Possibly 27.537574, 109.986285
Base 64	96034	Div Dep	Xining, Qinghai	36.853089, 101.377534
Base 65	96035	Reg	Tonghua, Jilin	41.599921, 126.248813
Base 66	96036	Reg	Sanmenxia, Henan	34.030839, 111.023038

WARHEAD TRANSPORT TO MISSILE BRIGADES

Warhead transport is likely a coordinated effort between Base equipment inspection units and Base logistical support regiments, although the exact delineation of responsibilities remains somewhat unclear. Both types of units have road and rail transport capabilities and have been noted transporting warheads. It is possible that equipment inspection units are focused on transfer of warheads between Base elements, while Base logistical regiments handle transport to subordinate missile brigades. Notably, all equipment inspection units are located within a short distance of their respective logistical regiments.[xiv]

Equipment inspection units are noted as having both road and rail transport capabilities. In one drill, an equipment inspection unit successfully delivered its cargo of warheads by deploying its warhead transport vehicles as decoys while transporting the warheads in common transport vehicles, fooling the opposition force.[185] Notably, equipment inspection transport missions are typically referred to as "transfer" [转运][186] or "transshipment" [转载运输][187] rather than "transport" [运输], perhaps suggesting that they are more concerned with transfer between points within the Base-level logistical chain rather than long-distance transport between higher and lower levels. These may include transfer from Base 67 rail termination points to the Base storage facility, transfer between the Base-level storage facility and equipment inspection stations,[188] and transfer to Base logistical regiments for long-range transport to missile brigades.[189]

[xiii] For more on equipment inspection security, see "Site Security" above.
[xiv] In some cases, the two headquarters are collocated; at most, they are within a roughly two-hour drive of one another.

Each Base has a logistics regiment,[xv] called either a comprehensive support regiment or service regiment depending on the Base. Comprehensive support regiments were first formed at four of the six Bases in 2017 by combining the Base repair factory, which conducted equipment repair and maintenance, with the Base service regiment, responsible for equipment storage and transport, including transport of nuclear warheads.[190] The exceptions to this reform were Base 61 and Base 63, which both formed comprehensive support regiments but also maintained their service regiments for logistics and transport.[xvi] These logistics regiments appear to be responsible for transporting missiles and warheads to the Base's missile brigades via both road and rail.[191] Likewise, the two remaining Base service regiments are both noted transporting nuclear warheads, suggesting they still maintain this function for their Bases.[192]

[xv] With the exception of Base 61, which has a brigade in addition to a regiment.

[xvi] The Base 61 service regiment was later upgraded to a brigade, likely to handle transport of the high number of conventional missiles/warheads the Base's brigades would utilize against Taiwan. The reason for Base 63's retention of a service regiment is less clear, but may be due to its relatively high number of silo-based units, which require special logistics for liquid fueling.

BRIGADE-LEVEL WARHEAD MANAGEMENT

Warheads have historically not been mated to missile bodies in peacetime, and it is unknown how many warheads are normally kept on-site at the brigade level versus how many are stored by the Base equipment inspection unit and transported to the brigades if needed. While the PLARF is working to implement a launch-on-warning (LOW) posture, and brigades now strive to keep at least part of their force in a state of high alert at any given time, no clear evidence has emerged as to how such warheads would be stored, tested, and maintained.[193]

It is also unclear when exactly warheads would be mated to the missile bodies for mobile missile brigades in the case of a launch order. Each brigade has at least one, and in some cases two technical battalions responsible for missiles prior to launch, including missile hoisting, loading, and pre-launch testing before handing the missiles over to brigade launch elements.[194] This battalion also receives and transports new missiles, as well as transporting and loading missile reloads in the field.[195] While one source described transport of conventional warheads, no mention of a technical battalion explicitly working with *nuclear* warheads was found.[196] However, at least one brigade, equipped with the dual nuclear-conventional DF-26 IRBM, has shown an ability to swap between conventional and nuclear warheads in the field as mission requirements change.[197]

Another possibility is that warhead mating takes place at the Base level, presumably by elements of the Base equipment inspection unit. Two sources were found which describe operations Bases simulating warhead mating as part of their training.[198] Equipment inspection personnel do appear to conduct launch training with missile brigades, suggesting they may provide warhead mating support prior to launch.[199]

In the case of silo-based brigades, warhead mating appears to take place on-site by brigade personnel, possibly of either the brigade technical battalion or the Base equipment inspection unit. In the past, silo-based personnel trained with dummy replacement equipment due to the higher level of difficulty and danger in using real equipment, but now claim to train with real equipment.[200]

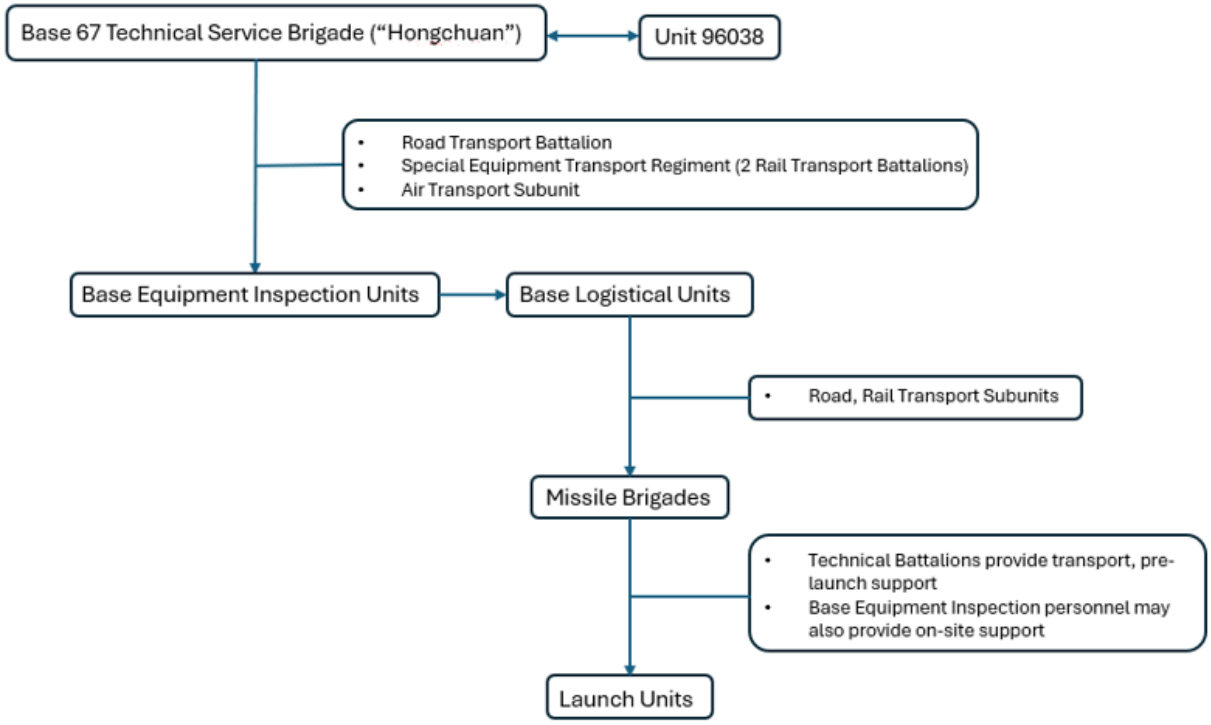

Image 17: Likely warhead logistical chain, from central stockpile to launch

CONCLUSION

This report provided an overview of publicly available information about the units charged with storing, testing, guarding, and transporting the PLARF's nuclear warheads, tracing the warheads from the central storage facility at Hongchuan, to the six operations Bases, to individual missile brigades.

While the report shines new light on the PLARF's warhead management operations and their organization, multiple knowledge gaps remain, especially at lower levels and for the PLARF's new and expanded silo force. Although recent limitations on open sources of information have made research more difficult, future work on this topic will hopefully be able to fill these remaining gaps. These include:

- What is the name and mission of Unit 96038? How does it interact with the main facility at Hongchuan?
- Are the Base 67 air defense and ECM regiments also guarding other key sites?
- What is the delineation of responsibilities between Base equipment inspection and logistical units? Who is transporting warheads to the missile brigades?
- At the brigade level, what is the delineation of responsibilities between the brigade technical battalion and on-site equipment inspection personnel?
- When and where are warheads mated to the missile bodies?

- What are the procedures for managing, testing, and transporting warheads for the PLARF's new silo force?

Nevertheless, the information we do have provides some interesting glimpses into potential weaknesses in the PLARF's nuclear management system.

First, much of the stockpile is stored at a single facility. While the facility is hardened and well-guarded against attack, it is a case of highly concentrated risk. Further, the infrastructure around this facility is basic, possibly with only a single narrow road in and out; blocking these roads could seriously delay operations. The highly centralized nature of the system also requires frequent transport of warheads by road or rail over long distances. While transport units boast about their exemplary safety records and are trained for contingencies, this does increase opportunities for accidents or wartime interdiction. Depending on how the PLARF's new silo fields are eventually supplied with warheads, these opportunities may increase in the coming years.

The literature also suggested past issues with disorganized and lax storage facilities and procedures, as evidenced by health problems among personnel. While it does appear that the PLARF has made significant progress here, it is unclear if these problems have been completely solved. The existence of outdated computer operating systems at least some facilities in recent years may suggest ongoing issues with dated infrastructure. Further, the heavy use of foreign equipment in certain areas of nuclear management indicates a possible technology chokepoint, particularly for more sophisticated equipment like remote-controlled robotics needed to deal with radioactive materials and clear obstacles. Finally, there are indications that the PLARF may increasingly have trouble retaining quality personnel. Recruiting and retaining educated and skilled personnel has been an ongoing challenge for the PLA as a whole, and the PLARF will likely exacerbate this problem by forcing more skilled engineers and technicians to serve in remote hardship posts on short notice.

Finally, simple math suggests that the PLARF may be trying to do more with less. It is well established that the PLARF has rapidly expanded in size in the past decade. In just a five-year period from 2016-2021, it increased the number of missile brigades under its command by approximately 35 percent, and the majority of these brigades were equipped with nuclear or dual-capable systems. Base 62, for example, previously commanded two nuclear-capable brigades, and now likely command four to five. Base 66 previously commanded three nuclear-capable brigades, and now likely commands six. Readiness levels have also increased, with brigades increasingly switching over to a launch-on-warning posture which likely places higher demands on its support network. Under these conditions, one would expect commensurate growth in nuclear support units. However, available open-source literature provides little evidence of this. Some units have increased in size, most notably Base 64's Equipment Inspection Brigade, possibly in response to increased demands.[xvii] However, other elements of the support system have not followed suit, even as they are now asked to service more units. It is thus worth asking if a system that was designed in a simpler and smaller-scale time of minimal deterrence doctrine is able to handle this workload—in some cases double the workload of only a few years earlier—or whether such a

[xvii] Hongchuan's Technical Service Brigade has also increased to brigade strength, but this appears to have more to do with the fact that it has absorbed more of the Base's existing capabilities under a single roof.

system would be increasingly stressed, perhaps even to the point of breaking down if prolonged high demands were placed on it in a crisis.

GLOSSARY OF CHINESE TERMS

General Terminology and Expressions

Core components – 核心部件
Equipment inspection – 装检
Equipment inspection operations – 装检作战
Fire intercept equipment – 火力拦截装备
"Guardians of the National Treasure" – 国宝卫士
"Guardian Spirits of the Restricted Zone" – 禁区守护神
"Go anywhere, win everywhere" – 输在哪里，赢在何处
"Hongchuan Spirit" – 红川精神
Inspection and checkout – 把关
Military representative – 军事代表
Missile and weaponry technical security personnel – 导弹武器技安员
"Mulans of Hongchuan" – 红川木兰花
Special vehicle – 特装车
Three-vehicle collective fire – 三车集火
Transfer (of warheads) – 转运
Whole course missile testing – 全流程导弹测试

Organizations

Central Military Commission – 中央军事委员会
Institute of Nuclear Technology (a.k.a. PLARF Research Academy 3rd Institute) – 核技术研究所
PLA Rocket Force (PLARF) – 中国人民解放军火箭军
PLARF Research Academy – 火箭军研究院
Second Artillery Force (SAF) – 第二炮兵

Place Names

Hongchuan – 红川
Xipo Township, Liangdang County – 两当县西坡镇
Maliuwan – 麻柳湾
Qinling Mountains – 秦岭山
Xinmiao Village – 新庙村
Weijiangsi, Feng County – 凤县温江寺

Units and Unit Types

Base – 基地
China Nuclear Emergency Rescue Team – 中国核应急救援队
Communications REG/BN – 通信团营
Communications Engineering REG – 通信工程团
"Comprehensive" (Logistical) Support REG/BN – 综合保障团/营
"Comprehensive Defense" REG – 综合防护团
Dadui (Group) – 大队
Emergency Management Group – 应急处置大队
Engineering Maintenance Support Group – 工程维护保障大队
Equipment Inspection Institute/Station – 装检研究所/站
"Iron River Warrior Company" – 铁川虎贲连
"Knife Edge" Specops Team – 刀锋特战队
Missile Simulation Training Center – 导弹武器模拟训练中心
Mobile Communications BN – 机动通通信营
National NBC Emergency Assistance Team – 核生化应急救援国家队
Operations Support REG/BN – 作战保障团/营
Outpost – 哨所
Rail Special Transport REG – 铁路特运团
Repair BN/Factory – 修理营/厂
Security BN – 警卫营
Security and Communications CO – 警卫通信连
Service REG – 勤务团
"Sharp Knife" Specops Team – 利刃特战队
Site Management BN/CO – 阵管营/连
Site Security CO – 阵地警卫连
Special Equipment Station – 特检站
Special Equipment Transport REG – 特装运输团
Storage Management BN – 贮管营
Subunit – 分队
Team – 队
Technical Service BDE/BN – 技术勤务旅/营
Telemetry subunit – 遥测分队
Transport BN – 运输营
Zongdui – 总队