



Training the People's Liberation Army Air Force Surface-to-Air Missile (SAM) Forces

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Preface

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More than two decades ago, the armed forces of the People's Republic of China embarked on a series of efforts to transform from a massive, low-tech force focused on territorial defense to a leaner, high-tech force capable of projecting power and influence around the peripheries of the nation, even against the expeditionary forces of the most capable adversary. By developing operational strategies tailored to meeting this objective; reforming the organization, training, and doctrine of the armed forces; and, perhaps most importantly, making large and sustained investments in new classes of weapon systems, China may be on the cusp of realizing the ambitious goals it has laid out for its armed forces. Without doubt, China's air and maritime forces today field capabilities that are compelling U.S. military planners to rethink their approach to power projection and to reorient important components of their modernization programs. China, in short, has become the "pacing threat" for the U.S. Air Force and Navy. As such, the importance of understanding the capabilities and limitations of China's air, naval, and space forces is self-evident. The mission of CASI is to contribute to that understanding.

CASI's research team brings to this work a mastery of research methods, understanding of China's military capabilities and doctrine, and the ability to read and understand Chinese writings. When undertaking research for CASI reports, analysts used a variety of Chinese-language primary-source documents on PLA Army and PLAAF training, operations and doctrine. This includes *Kongjun Bao* (*Air Force News*) and *Huojianbing Bao* (*Rocket Force News*)—the daily newspapers of the PLAAF and PLA strategic missile forces—as well as defense white papers, PLA encyclopedias, and books by military officers and academics affiliated with the PLA (such as the Academy of Military Science). These publications are considered authoritative assessments and reporting on training, strategy, and concepts for how

the PLAAF and missile forces prepare for military operations and warfare in general. It is important to acknowledge, however, that these PLA publications also have some weaknesses, and that reliance on open sources necessarily has some limitations. The growing availability of primary-source material helps to compensate for at least some of these challenges.

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Table of Contents

Preface.....	iii
Figures and Table.....	vii
Summary	viii
Acknowledgments.....	ix
Abbreviations.....	x
1. Introduction.....	1
2. Background on China's Air Defense Forces	3
Units, Equipment, and Force Structure.....	3
3. Understanding PLAAF SAM Training.....	7
Historical Evolution.....	7
Current Training Process and Emphasis	9
Basic Training Requirements.....	9
Training Cycle and Institutions.....	10
Training Guidance	12
Training Material	14
4. PLAAF SAM Training Activities, 2013–2014.....	16
Methodology.....	16
2013–2014 PLAAF SAM Training Data.....	16
Analysis of Change in Training over Time.....	17
Methodological Limitations.....	18
Geographic Indicators of PLAAF SAM Training, 2013–2014	19
Temporal Indicators of PLAAF SAM Training, 2013–2014.....	21
PLAAF SAM Training Content, 2013–2014.....	23
Changes in SAM Training over Time, 2013–2014 Versus 2004–2006.....	24
5. Key Training Themes and Implications.....	27
Unit Combat Training Is More Realistic and Challenging.....	27
Units Increased Opposition-Force Training Against Aviation Units; SAM Units	
Train in Countering Advanced Air Combat Methods.....	27
Units Engage in More Unscripted Training and Training in Unfamiliar Territory	29
Units Are Increasing Training Duration and Experimenting with Ways to More	
Effectively Use All Personnel.....	30
Units Practice Denial and Deception, with an Emphasis on Striking Low-Altitude Targets ..	31

Units Undergo Significant Training to Engage Adversaries Flying at Low and Extreme Low Altitudes	33
Units Engage in Substantial Mobility and Nighttime Training and Some Critical Weaknesses and Limitations Still Remain.....	35
Logistical Problems Decrease Units' Readiness and Ability to Quickly Move to Designated Locations.....	35
Units Are Improving Their Ability to Conceal and Avoid Detection When on the Move	36
Safety Is a Serious Concern and Limitation on SAM Training	37
Units Are Engaging in More Complex Night Operations but Have Varying Degrees of Capability to Operate at Night.....	38
There Is Limited Joint and Combined-Arms Training, but Units Share Data and Coordinate Targeting	39
6. Conclusion	41
References.....	43

Figures and Table

Figures

2.1. PLA Air Defense Units (Active Forces) Based on China's Former Military Regions as of December 2015	5
4.1. Frequency of SAM Training Activities by China's Former Seven Military Region Air Forces (November 2013–October 2014)	20
4.2. PLAAF SAM Training and Exercise Cycle (November 2013–October 2014)	22
4.3. PLAAF SAM Training and Exercise Content (November 2013–October 2014).....	23
4.4. Changes in PLAAF SAM Training and Exercise Content over Time.....	25

Table

1.1. PLAAF SAM Launchers, 2015.....	4
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Summary

This report analyzes key trends and themes in China's People's Liberation Army Air Force (PLAAF) surface-to-air missile (SAM) unit training. After providing background information on China's air defense forces, the report introduces the basics of PLAAF SAM training, including training requirements, trends in recent training activities, and analysis of training themes. To analyze training activities and provide basic quantitative indicators, we constructed a data set that includes every SAM training activity discussed within a one-year time frame from November 1, 2013, to October 31, 2014, in the PLAAF's official newspaper, *Kongjun Bao* (空军报, hereafter abbreviated as KJB).¹ We also draw from previous studies and data on SAM training.

Based on this research, we found that PLAAF SAM units are improving their capabilities, although progress is uneven and capabilities may vary significantly between similarly equipped units. Based on data collected on PLAAF SAM training activities, the intensity of SAM training varies across China's former seven military regions. SAM units near the capital area and in the coastal regions appear to be most active. SAM units follow a yearly training cycle, with training peaking during the summer and early fall. Content-wise, PLAAF SAM units are engaging in more realistic and challenging combat training compared with the mid-2000s. They are moving beyond supporting PLAAF aviation training to actively participating in more complex training exercises, including countering and defeating aviation opponents engaged in sophisticated air assaults. They have increased the duration and difficulty of their training, continue to emphasize denial and deception tactics, and focus significant efforts on countering low- and extreme-low-altitude targets. SAM units are engaging in substantial mobility and night training, but face logistical hurdles that undercut their ability to rapidly move to operating locations and safety concerns that hinder their ability to engage in difficult and sophisticated training. There is limited joint (e.g., two or more services) and combined-arms (e.g., two or more branches within the PLAAF) training, but units appear to be moving beyond simple altitude deconfliction toward sharing data, employing more sophisticated target identification methods, and coordinating firepower with aviation units.

¹ *Kongjun Bao* has an official English title of *Air Force News*, but is better known by its Chinese name.

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Abbreviations

AAA	antiaircraft artillery
AD	air defense
CASI	China Aerospace Studies Institute
ECM	electromagnetic countermeasures
KJB	<i>Kongjun Bao</i>
MR	Military Region
MRAF	Beijing Military Region Air Force
MUCD	Military Unit Cover Designator
NASIC	National Air and Space Intelligence Center
NCO	noncommissioned officer
OJT	on-the-job training
OMTE	Outline of Military Training and Evaluation
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
RCS	radar cross-section
SAM	surface-to-air missile

1. Introduction

Chinese air defense forces (防空兵), which include surface-to-air missiles (SAMs), antiaircraft artillery (AAA), radar, and electronic countermeasure troops, play a crucial and strategic role in the country's defense.² Chinese strategists assume that potential adversaries are likely to initiate conflicts via air attacks and that such attacks are likely to be maintained throughout the duration of conflict.³ They also believe that the battle between what they call "air raid" and "anti-air raid" forces would directly affect a conflict's progression and final outcome.⁴ Internationally, Chinese strategists have observed that, without a strong air defense capability, a country's national security and territorial integrity are at risk and the country may lose operational superiority during wartime, causing irreparable losses and damage.⁵ A strong air defense capability can thus help China defeat enemy air assaults, win air defense battles, and deter potential adversaries.⁶

Given the stated importance of the air defense mission for China, this report analyzes the training of ground-based air defense units within the People's Liberation Army Air Force (PLAAF). These units engage in complex training, possess China's most advanced air defense weapons, and are a critical part of the country's air defense forces. Analyzing their training provides useful insights into Chinese air defense capabilities. While much is already known about the equipment fielded by Chinese air defense forces, less is understood about the training these units conduct and how training activities shape their operational effectiveness—particularly at the unit level. This report contributes to the existing unclassified literature by analyzing the key themes, strengths, and weaknesses of training conducted by PLAAF SAM units.

This report is divided into five sections. The first reviews China's air defense forces and highlights the importance of PLAAF SAM forces. The second examines the historical evolution of PLAAF SAM forces and their training requirements. The third provides quantitative indicators of how PLAAF SAM training varies across China's former seven military regions and

² Major open-source writings on the PLAAF include: Kenneth W. Allen, Glenn Krumei, and Jonathan D. Pollack, *China's Air Force Enters the 21st Century*, Santa Monica, Calif.: RAND Corporation, MR-580-AF, 1995; National Air and Space Intelligence Center, *People's Liberation Army Air Force 2010*, Wright-Patterson Air Force Base, Ohio, 2010; Roger Cliff, John Fei, Jeff Hagen, Elizabeth Hague, Eric Heginbotham, and John Stillion, *Shaking the Heavens and Splitting the Earth: Chinese Air Force Employment Concepts in the 21st Century*, Santa Monica, Calif.: RAND Corporation, 2011; and Richard P. Hallion, Roger Cliff, and Phillip C. Saunders, eds., *The Chinese Air Force: Evolving Concepts, Roles, and Capabilities*, Washington, D.C.: National Defense University Press, 2012.

³ See, for example, PLA Academy of Military Science Military Strategy Research Department, ed., *The Science of Military Strategy* [战略学], Beijing, China: Military Science Press, 2013, p. 106.

⁴ PLA Academy of Military Science Military Strategy Research Department, 2013, p. 225.

⁵ Wang Fengshan [王凤山], Li Xiaojun [李孝军], Ma Shuanzhu [马拴柱] et al., *Science of Modern Air Defense* [现代防空学], Beijing, China: China Aviation Industry Press [航空工业出版社], 2008, p. 6.

⁶ Wang Fengshan [王凤山], Li Xiaojun [李孝军], Ma Shuanzhu [马拴柱] et al., 2008, p. 8.

across time as well as what content units are incorporating in their training. The fourth section highlights four key themes in PLAAF SAM training. The final section summarizes the key findings.

It is important to note that our methodology relies on the quality, content, and nature of the reporting on SAM training found in official PLA media sources, primarily the PLAAF's official newspaper, *Kongjun Bao* (空军报, hereafter abbreviated as KJB).⁷ While we found KJB articles to be unusually candid on a number of fronts, including on unit training weaknesses and tactics, we have built in several assumptions about the coverage of SAM training activities in the newspaper. These assumptions are discussed in further depth in the methodology section.

Finally, we acknowledge the limitations inherent in undertaking an unclassified study of this nature. Assessing some specific dimensions of SAM training would require technical data that, to our knowledge, is not publicly available. There is also limited public information on SAM equipment and force structure.

⁷ *Kongjun Bao* has an official English title of *Air Force News*, but is better known by its Chinese name.

2. Background on China's Air Defense Forces

China's air defense forces defend the country against threats from the air and space. Units across China's military services are responsible for this important mission and are expected to be ready to employ coordinated and layered firepower against such threats.⁸

Units, Equipment, and Force Structure

The PLA possesses air defense forces in the PLA Army (PLAA), PLA Navy (PLAN), and PLAAF.⁹ Of these, the PLAAF has been called “the mainstay of national territorial air defense.”¹⁰ Its air defense forces typically consist of several types of ground-based units:

- surface-to-air missile (地空导弹兵/导弹兵) (SAM) branch units
- antiaircraft artillery (高射炮兵/高炮兵) (AAA) branch units
- radar specialty troops (雷达兵)
- electronic countermeasure troops (电子对抗兵).¹¹

PLAAF fighter aviation troops (歼击航空兵) also play a key role in air defense.¹²

Today, the PLAAF employs roughly 300 self-propelled and at least 300 towed SAM launchers, including modern, long-range systems as well as aging systems. Table 1.1 shows the ranges and quantities of these systems. Of the systems listed, the HQ-7s, HQ-9s, HQ-12s, SA-10s, and SA-20s are the most modern and were either imported or entered service following indigenous development after 1990. Other systems, such as the HQ-2 (SA-2), date as far back as the early 1960s.¹³ Currently, modern strategic SAMs (with ranges of at least 100 kilometers) make up approximately 30 percent of the total PLAAF inventory; however, with the advent of the indigenously produced HQ-9 and the pending acquisition of the most advanced Russian SAM (the SA-21), this percentage is expected to rise.

⁸ Yao Wei [姚卫], ed., *China Air Force Encyclopedia* [中国空军百科全书], Vol. 1, Beijing, China: Aviation Industry Press [航空工业出版社], 2005, p. 75.

⁹ As of 2015, the former PLA Second Artillery (PLASAF), now the PLA Rocket Force, had a SAM “experimental training unit” (试训队) at a test base in the former Lanzhou MR; additional discussion of this unit follows Figure 2.1.

¹⁰ “White Paper Outlines China's Air Defense,” Xinhua, April 16, 2013.

¹¹ The 2011 authoritative *People's Liberation Army Military Terminology* (commonly known as the *Junyu*) only includes these four forces under its definition of air defense forces. See People's Liberation Army, *People's Liberation Army Military Terminology* [中国人民解放军军语], Beijing, China: Military Science Press, 2011, p. 752.

¹² Yao Wei [姚卫], ed., 2005, p. 74.

¹³ An original Soviet variant of the SA-2 was responsible for shooting down the U-2 flown by Francis Gary Powers on May 1, 1960, while flying over the Soviet Union.

Table 1.1. PLAAF SAM Launchers, 2015

SAM System Name	Range (Kilometers)	Quantity (Launchers)
HQ-2 (SA-2)	35	300+
HQ-6D	10	24
HQ-7	12–15	60+
S-300 PMU (SA-10C)	100	32
S-300 PMU-1 (SA-20A)	150	64
S-300 PMU-2 (SA-20B)	200	64
HQ-12 (KSA-1)	50	24
HQ-9	200	32+
S-400 (SA-21)	400	0 ^a

SOURCES: International Institute for Strategic Studies, *The Military Balance 2015*, London, United Kingdom: Routledge, 2015, pp. 242, 496; Eric Heginbotham, Michael Nixon, Forrest E. Morgan, Jacob L. Heim, Jeff Hagen, Sheng Li, Jeffrey Engstrom, Martin C. Libicki, Paul DeLuca, David A. Shlapak, David R. Frelinger, Burgess Laird, Kyle Brady, and Lyle J. Morris, *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996–2017*, Santa Monica, Calif.: RAND Corporation, 2015, p. 101. Ranges of HQ-6D and HQ-7 from IHS Jane's, "Aerospace, Defence and Security," online database.

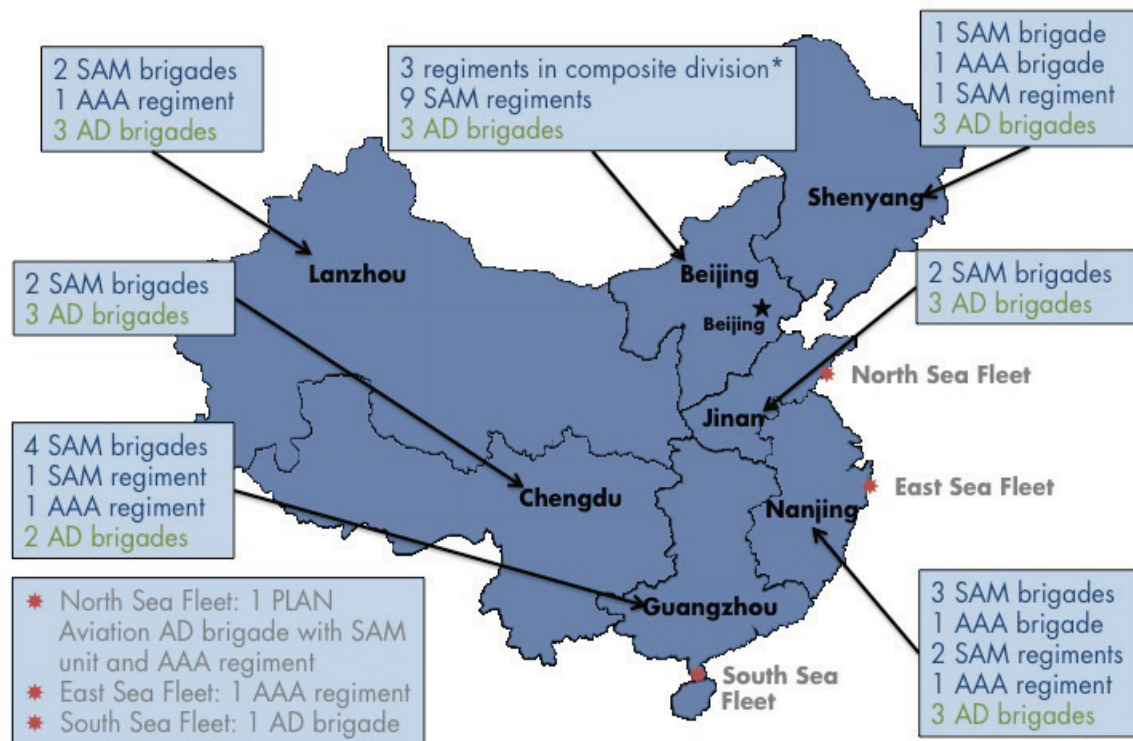
NOTE: The acquisition of the SA-21 system is currently ongoing.

Figure 2.1 shows the home location of active-force PLA SAM and AAA units in the PLAAF, PLAA, and PLAN. PLAAF units are in blue, PLAA units are in green, and PLAN units are in gray (the red dots indicate PLAN fleet headquarters). Compared with its sister services, the PLAAF operates the most sophisticated air defense systems, including the country's most advanced and longest-range SAM systems. These systems—the SA-10, SA-20, and HQ-9—are deployed in and around the former Beijing Military Region (MR) as well as in the country's south, including in the former Nanjing MR.¹⁴ (The breakdown in Figure 2.1 as well as subsequent charts in this study reflect the PLA's organizational structure in 2015 prior to the dissolution of the seven MRs and their replacement by five "theater commands" in 2016. As of June 2016, the subordination of specific SAM units to the various "theater commands" is not yet known.) Additionally, China's ongoing acquisition of Russian SA-21s is likely to fall into the PLAAF inventory and could represent a significant strengthening of its capabilities, depending on the details of the final deal.¹⁵

¹⁴ There is very limited open-source discussion of locations of Chinese SAM systems, but one nonauthoritative Chinese source provides specific information on which units have which systems: "Compilation of Forces: PLA Air Force Surface-to-Air Missile Forces Compilation" ["部隊編制] 解放軍空軍地空導彈部隊編制"], SSkyn Hong Kong, February 29, 2012.

¹⁵ Office of the Secretary of Defense, "Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2015," Arlington, Va.: U.S. Department of Defense, 2015, p. 12.

Figure 2.1. PLA Air Defense Units (Active Forces) Based on China's Former Military Regions as of December 2015



SOURCES: International Institute for Strategic Studies, 2015; official Chinese media. We cross-referenced the units included in the *Military Balance* with Chinese newspaper articles and, to the extent possible, verified the existence of individual units or otherwise modified the order of battle. These sources included *PLA Daily* [解放军报], 2014; the authors' 2013–2014 KJB data set; other KJB articles, 2012–2015; articles from the seven MR newspapers, 2014–2015; CCTV-7's "Military Report" [军事报道] program; and various articles from *People's Navy* or *Renmin Haijun* [人民海军], 2011–2015.

NOTES: AD = air defense.

* We were able to identify at least one regiment within the composite division in the former Beijing MR and have inferred that two others exist as well, for a total of three regiments in this division. See "PLA (Including PAPF) MUCDs and Stationed Guard Locations (Second Part)" [解放军 (含武警) 番号及驻防情况(下)], posted by user Snow Cyclone Rising [雪卷风升], Sina.com, February 26, 2012.

As Figure 2.1 shows, China's active air defense forces in the PLAAF are concentrated in the areas near Beijing and the coastal regions. The former Beijing Military Region Air Force (MRAF) (军区空军) had the highest number of PLAAF air defense units, reflecting the priority placed on defending the capital. The former Beijing MRAF also had the only composite division consisting of both SAM and AAA regiments operated by the PLAAF.¹⁶ After the former Beijing

¹⁶ The PLAA units, called *air defense* units in Chinese, include a combination of both AAA guns and SAMs. Some SAMs have been introduced to older, existing PLAA AAA units to form these air defense units. See Dennis J. Blasko, "The PLA Army/Ground Forces," in Kevin Pollpeter and Kenneth W. Allen, eds., *PLA as Organization*,

MR, the former Nanjing MR had the second-highest number of PLAAF air defense forces. It is important to note that Figure 2.1 represents the home location of the units, as units have become increasingly mobile and are deploying to other MRs for training.¹⁷

Like the PLAAF, the PLA Army has units dispersed throughout the country. The PLA Navy has the smallest number of land-based SAM and AAA units, with discussion in official PLA media of one air defense brigade in the coastal defense branch of the South Sea Fleet and one AAA regiment in the East South Fleet's "fleet forces" (舰队).¹⁸ There is also one brigade that includes at least one SAM unit and one AAA regiment, which is subordinate to North Sea Fleet Naval Aviation.¹⁹ Not included on the map, the PLA Rocket Force also has a SAM "experimental training unit" (试训队) at a test base in the former Lanzhou MR.²⁰ Along with the active force, a significant portion of China's PLAA reserve forces and militia has air defense responsibilities.²¹

Vol. 2, Vienna, Va.: Defense Group Inc., 2014, p. 227. In the PLAN, air defense units can also have SAMs in addition to AAA guns.

¹⁷ PLAAF SAM units, for example, often travel to use the Dingxin facility in Gansu Province for training and testing. For more information on Dingxin, see Kenneth W. Allen, "PLA Air Force, 1949–2002: Overview and Lessons Learned," in Laurie Burkitt, Andrew Scobell, and Larry M. Wortzel, eds., *The Lessons of History: The Chinese People's Liberation Army at 75*, Strategic Studies Institute, July 2003, p. 135.

¹⁸ Although this report only focuses on land-based SAMs, it is worth noting that the PLAN's shipborne area air defenses have grown increasingly capable. On the PLAN's land-based systems, see, for example, Yan Shuofeng [颜铄沅], Yang Pengyu [杨鹏宇], and Li Qing [李晴], "Casting the Sea-Air Shield" ["铸就海天盾牌"], *People's Navy* [人民海军], May 14, 2014, p. 1; Wu Zhijie [吴智杰] and Hu Lin [胡林], "Filling the Gaps in Producing Combat Strength Generation" ["补齐战斗力生成的短板"], *PLA Daily* [解放军报], June 28, 2014, p. 10. See also U.S. Department of Defense, *Directory of PRC Military Personalities*, Washington, D.C.: Defense Intelligence Agency, 2014, p. 72. Nan Li lists three air defense units in the PLAN "fleet forces" (舰队), with one air defense unit in each fleet. These include the 2nd Air Defense Regiment in Qingdao (North Sea Fleet), the 8th Air Defense Brigade in Ningbo (East Sea Fleet), and the 7th Air Defense Brigade in Sanya (South Sea Fleet). See Nan Li, "The People's Liberation Army Navy as an Evolving Organization," Kevin Pollpeter and Kenneth W. Allen, eds., *The PLA as Organization v.2.0*, Washington, D.C.: Defense Group, Inc., 2014, pp. 305–338. However, we were unable to corroborate the existence of these North and East Sea Fleet "fleet forces" units via reporting from Chinese sources.

¹⁹ Zhao Peng [赵鹏] and Wang Jing [王晶], "'Internet of Things' Sets up at Grassroots Level Company" ["'物联网'落户基层连队"], *People's Navy* [人民海军], November 1, 2013, p. 2; Chen Zhe [陈哲], Zhu Weijun [朱为俊], and Zhu Ya [朱亚], "A Measure of Things: How Important Are Soldiers?" ["称一称，军人的分量有几重"], *People's Navy* [人民海军], October 24, 2014, p. 4.

²⁰ *Huojianbing Bao* (Rocket Force News) [火箭兵报], article title not known, December 11, 2012, p. 2; "Learn from the Spirit of the 18th Party Congress, Strengthen the Will to Win" ["学十八大精神磨砺打赢斗志"], *Huojianbing Bao* (Rocket Force News) [火箭兵报], December 1, 2012, p. 1. Both sources provide a Military Unit Cover Designator (MUCD) for the unit as Unit 96401. This identifies the unit with Testing Base 22 in the former Lanzhou MR, near Xi'an. See U.S. Department of Defense, *Directory of PRC Military Personalities*, Washington, D.C.: Defense Intelligence Agency, 2015, p. 112.

²¹ Little information is available about the PLAAF air defense reserve forces, which are a recent addition to the PLAAF's force structure—the first PLAAF SAM reserve regiment was stood up in 2005. Almost all of PLAAF reserves are either SAM or radar units. At least one military region, Nanjing, has a reserve SAM unit, and Beijing MR reportedly has at least one radar unit as well. For more information, see Ding Yibo [丁义波], Yan Guoyu [闫国育], and Chi Yuguang [迟玉光], "Record of a Certain Air Force Reserve Surface-to-Air Missile Regiment

3. Understanding PLAAF SAM Training

This section analyzes the training of PLAAF SAM forces, including the historical evolution of PLAAF SAM training as well as training guidelines.

Historical Evolution

PLAAF SAM units have improved and significantly adapted their capabilities and tactics to deal with varied threats multiple times since the 1950s. They have not, however, tested the most recent changes in combat, as the last time a PLAAF SAM unit shot down an enemy aircraft was in 1987.²²

Since the 1980s, China has recognized that its air defense force could face very capable opponents. According to the PLAAF-published book *Air Force Operations Research* (空军作战研究),

air defense will become an increasingly difficult challenge as China's potential enemies acquire more advanced aircraft that can attack from many directions at low altitudes under cover of electronic jamming.²³

In conflicts abroad, China saw the use of third-generation SAM systems in combat.²⁴ Chinese sources assessed that these new SAMs were more capable of dealing with electromagnetic jamming, precision strike attacks, and saturation attacks than older systems. They also achieved some success in intercepting ballistic missiles and striking stealth aircraft.²⁵

Comprehensively Strengthening Its Combat Capability Facilities” [“空军某预备役地空导弹兵团全面加强战斗力建设纪实”], *China Defense News* [中国国防报], March 9, 2015; State Council of the People's Republic of China [中华人民共和国国务院], *China's National Defense in 2008* [2008 年中国的国防], Beijing, China, January 2009; “Shanghai Air Force Reserve Surface-to-Air Missile Regiment's Visit to My Office” [“上海空军预备役地空导弹团走访我局”], Fengxian Planning and Land Website [奉贤规划和土地网站], September 27, 2013; “Image: Beijing MRAF Reserve Radar Battalion's Emergency Mobilization to Construct a 'Skynet'” [“组图：北空某预备役雷达营紧急机动织‘天网’”], QQ.com, September 10, 2009.

²² On October 5, 1987, a PLAAF SAM unit shot down a Vietnamese MiG-21 that crossed the border into China's Gansu Province. See National Air and Space Intelligence Center, 2010, p. 17.

²³ Teng Lianfu [滕连富] and Jiang Fusheng [姜富生], eds., *Air Force Operations Research* [空军作战研究], Beijing, China: National Defense University Press [国防大学出版社], May 1990.

²⁴ *China Air Force Encyclopedia* describes three global generations of SAM systems: the first generation from 1950s to the early 1970s, the second generation from the early 1970s to the mid-1980s (with some use of older first-generation equipment during this period as well), and the third generation of SAM systems from the mid-1980s onward. However, the encyclopedia does not list the specific systems that belong to these generations. See Yao Wei [姚卫], ed., 2005, p. 133.

²⁵ Yao Wei [姚卫], ed., 2005, p. 133.

As a result of these developments and larger geopolitical changes, from 1985 onward, PLAAF SAMs no longer trained for defending against large-scale air assaults (大规模空袭) but sought to counter medium- and small-scale precision air assaults (中小规模精确空袭). Augmented by newer systems with improved ranges, SAM units transitioned from key point air defense (要地防空) to area air defense (区域防空) by expanding their protection of China's key political and economic centers to defending larger regions. The PLAAF also began using more than one type of SAM system to implement layered firepower that coordinated systems with different ranges and capabilities.²⁶

Learning from the then-ongoing Kosovo War, in May 1999, the Chinese Central Military Commission tasked its air defense forces to train to attack incoming ballistic and cruise missiles, stealth aircraft, and helicopters and defend against precision strike, electronic interference, and reconnaissance and surveillance. This was described as the new “three attacks and three defenses” (三打三防) concept,²⁷ and SAM and AAA units adjusted their training accordingly.²⁸

In the following years, Chinese lessons learned from the wars in Kosovo and Iraq (2003) had several implications for SAM training. The most important was that PLAAF SAM forces should employ “nimble operational arts summarized as ‘stealth, deception, change, dispersion and movement’”²⁹ to counter a technologically superior adversary.³⁰ This lesson would be directly reflected in three key SAM combat methods described in the section on SAM training materials later in this chapter. Other lessons included being prepared for potential adversaries to commence air raids at night and to engage in “noncontact” operations in which attacks were executed beyond the enemy's visual range or “firepower killing-and-wounding radius.”³¹ China also needed to avoid Serbia's “one-sided” defense and adopt a “multisided” ability to conduct “integrated air, land, sea, space and electronic strikes.”³²

Written in 2005, the *China Air Force Military Encyclopedia* viewed future PLAAF SAM training as likely to increasingly focus on countering high-technology air assaults. It anticipated

²⁶ Yao Wei [姚卫], ed., 2005, p. 133.

²⁷ It is described as new because China had used the term in the 1960s and 70s to describe attacking aircraft, tanks, and paratroopers and defending against nuclear, chemical, and biological weapons. See “PLA's ‘Three Attacks Three Defenses’ and New ‘Three Attacks Three Defenses’” [“解放军的‘三打三防’和新‘三打三防’”], *Sina News*, October 13, 2000.

²⁸ Since the late 2000s, official documents have rarely used the term to describe training foci, but PLAAF's air defense forces are likely to still employ the concept to identify particular threats within a larger set of threats to counter.

²⁹ Military Training Department of the General Staff of the Chinese People's Liberation Army, *Research into the Kosovo War*, Beijing, China: Liberation Army Publishing House [解放军出版社], 2000, p. 63.

³⁰ For more specifics, see Military Training Department of the General Staff of the Chinese People's Liberation Army, 2000, pp. 100–105.

³¹ Wang Yongming, Liu Xiaoli, and Xiao Yunhua, *Research into the Iraq War*, Beijing, China: Liberation Army Publishing House [解放军出版社], March 2003, pp. 139, 141.

³² The Military Training Department of the General Staff of the Chinese People's Liberation Army, 2000, p. 71.

that PLAAF would increasingly employ more scientific means of training its SAM units at training bases and via simulations, as well as networked training. Attacking tactical ballistic missiles, low-altitude targets, and targets with low-radar cross-section (RCS) as well as countering electronic jamming were also expected to become crucial training topics.³³ Chinese media coverage from at least 2009 onward also discusses the development of fourth-generation SAMs both globally and at home.³⁴

Current Training Process and Emphasis

After our overview of the evolution of the PLAAF SAM training priorities, the following sections examine current SAM training. They include training requirements and institutions, the SAM training cycle, regulations and guidelines that set the course and direction of training, and training materials that point to the key combat methods that units are working on.

Basic Training Requirements

At the most basic level, training is influenced by the number of days the force is required to participate in unit operations and activities. Historically, PLAAF SAM units have had relatively low training requirements. The 1990 *People's Liberation Army Military Training Regulation* (中国人民解放军军事训练条例), the most recent source available stipulating basic SAM training requirements, set requirements for PLAAF SAM units comparable with those of PLAA units, but lower than those for PLAAF aviation and Second Artillery (now Rocket Force) units and, in some aspects, also lower than requirements for the PLAN. It stipulated that PLAAF SAM units were supposed to train 140 days over the course of ten months each calendar year.³⁵ PLAAF SAM training activities also required one of the lowest participation rates across military services and branches, implying lower overall standards than those for other troops: Training conducted at the division, brigade, or regiment level needed to have at least 80 percent of SAM companies participating and, within each company, at least 80 percent of the troops needed to

³³ Yao Wei [姚卫], ed., 2005, p. 287.

³⁴ See “Expert: H-9 has Anti-Missile Capabilities; Fourth Generation of Anti-Aircraft Guided Missiles Being Researched” [“专家：红-9有反导能力 第四代防空导弹在研”], *PLA Daily* [解放军报], October 12, 2009. The article (an interview with a PLAAF colonel) does not mention specific Chinese systems by name, but the article title and pictures accompanying the text reference the CSA-9 (HQ-9) as a Chinese fourth-generation system. See also “Media States China’s Fourth Generation Anti-Aircraft Guided Missile HQ-26 Will Come Soon, Will Be Paired with New Destroyer” [“媒体称中国第四代防空导弹 HQ-26 将面世配新大驱”], *World News* [世界报], March 28, 2013.

³⁵ This is significantly less than the required 240 days of training for PLAAF active duty aviation troops. In contrast to the active force, reserve units typically only train 30 days every calendar year. See State Council of the People’s Republic of China, *China’s National Defense in 2008*. See Chinese Central Military Commission [中央军委], *People’s Liberation Army Military Training Regulation* [中国人民解放军军事训练条例], April 6, 1990.

take part in the training.³⁶ Like all other military units, PLAAF SAM units needed to formulate yearly, periodic, monthly, and weekly training plans. Unlike PLAN submarine, PLAAF aviation, and Second Artillery (now Rocket Force) units, PLAAF SAM units did not have to formulate their own branch plans.³⁷ Given that the 1990 guidance is the most recent available that discusses basic SAM training requirements, however, it is important to note that some requirements have likely evolved, as the PLAAF has acquired more modern and sophisticated SAM systems, such as SA-10s and SA-20s, in the intervening years.³⁸

Training Cycle and Institutions

The PLAAF training cycle is heavily based around the training cycle of two-year enlisted PLAAF “recruits” (conscripts), who make up a large proportion of PLAAF service members in some, but not all, of the five branches.³⁹ According to an article in Xinhua, PLA-wide recruitment used to begin on November 1 of each year, with new recruits reporting for duty in mid-December. Beginning in 2013, the recruiting cycle shifted earlier to start on August 1, 2013, with new recruits reporting in early September for enlistment training and subsequently reporting to their units around January 2014.⁴⁰ The three-month shift in the recruiting cycle for enlisted troops has occurred for a number of reasons, primarily to attract more college graduates to the military in the summer months following graduation. Based on reporting in KJB, the cycle for new recruits for the SAM forces largely tracks with the new PLA-wide dates mentioned in the Xinhua article from 2013 onwards.⁴¹ Although little information is available on the nature of this

³⁶ For comparison, aviation unit training held at the division, independent regiment, or independent “dadui” (battalion leader-grade) requires the participation of at least 85 percent of the troops. At each participating base, at least 90 percent of the troops must take part. Chinese Central Military Commission [中央军委], 1990.

³⁷ Chinese Central Military Commission [中央军委], 1990.

³⁸ This regulation was passed in 1990 and posted in original form on the Chinese Ministry of Defense website in 2009. We were not able to locate more recent sources stipulating basic SAM training requirements. The SA-10 first appears in PLAAF inventories in the early to mid-1990s according to the International Institute for Strategic Studies’ *Military Balance*; the SA-20 first appears in the early 2010s. See International Institute for Strategic Studies, *The Military Balance 1994–1995*, London, United Kingdom: Oxford University Press, 1994, p. 173; International Institute for Strategic Studies, *The Military Balance 2007*, London, United Kingdom: Routledge, 2007, p. 281; and International Institute for Strategic Studies, *The Military Balance 2012*, London, United Kingdom: Routledge, 2012, p. 238.

³⁹ The five branches of the PLAAF are aviation, SAMs, AAA, airborne, and radar.

⁴⁰ Zhao Hui [赵辉], ed., “Special Report: Recruitment Policy Adjustment – Many Benefits to Bringing Time Frame Forward” [“解码 征兵政策调整 时间提前好处多多”], Xinhua, July 8, 2013.

⁴¹ Zhang Rui [张睿] and Hou Ningning [侯宁宁], “New Recruits Assigned to Companies After Training, Seize on Best Time for ‘Counterattack’” [“新兵下连, 把握 ‘逆袭’ 最佳时期”], *Kongjun Bao*, December 20, 2013, p. 3; Zeng Fanlun [曾繁伦] and Yi Yongyong [易勇勇], “New Key Training Personnel Welcome New Recruits” [“新训骨干迎新兵”], *Kongjun Bao*, September 15, 2014, p. 1; Yang Yong [杨勇] and Hou Ningning [侯宁宁], “Infuse New Recruits with Fighting Genes” [“把战斗基因注入新兵血脉”], *Kongjun Bao*, September 17, 2014, p. 1; Sun Zhiya [孙志亚] and Gan Huan [甘欢], “The Starting Point for Realizing the Dream” [“圆梦的起点”], *Kongjun Bao*, September 23, 2014, p. 2. KJB reports that some old recruits were demobilized in late 2013, suggesting overlap between the new and old recruits for the fall of 2013. See, for example, Zhu Wenhua [朱文华], Zhang Tao [张涛],

training for SAM forces, *Science of Air Force Military Training* notes that at least some SAM enlisted troops first undergo “enlistment and specialized training at dedicated training institutions” and later on “continue carrying out various kinds of specialized training according to their job postings.”⁴²

PLA units are required to engage in at least four months of field training (野外驻训) every year, and field training typically peaks during the summer to early fall.⁴³ Larger drills and exercises are often held during field training, such as Red Sword, one of PLAAF’s largest annual exercises. After new recruits again join the force in early fall, SAM units continue lower-level training and prepare for end-of-year evaluations.⁴⁴ Conscripts and noncommissioned officers can become officers, but they must attend one of the PLAAF’s multiple officer academic institutions. Based on age limits and time in service, conscripts can apply after their first year and NCOs can apply after their second year.⁴⁵ The application process is typically initiated between March and April annually.⁴⁶

and Liu Yang [刘洋], “New Healthy Trends at Hand for All of Us” [“新风正气在你我身边”], *Kongjun Bao*, December 24, 2013, p. 3. This overlap has little impact our quantitative assessment of SAM training intensity in the later section of this report for two reasons. First, our data set begins in November, at which point the old recruits would have been demobilized based on the old cycle. Therefore, our data set does not capture the period of personnel overlap in 2013 during which the PLA was transitioning to the new cycle. Second, our data captures the number of training events, drills, and exercises, not the number of personnel participating in each event.

⁴² See Hei Weirong [何为荣], ed. *Science of Air Force Military Training* [空军军事训练学], Beijing, China: Military Science Press [军事科学出版社], April 2006, p. 254. In one Beijing MRAF unit, this initial training ran from September to December and then the new recruits joined various units. Some new enlisted personnel received both basic training and on-the-job training (在职训练) (OJT) at their operational unit. The PLAAF does not have a single training base similar to the USAF’s Lackland Air Force Base for training all new enlisted personnel. See Zhang Rui [张睿] and Hou Ningning [侯宁宁], 2013, p. 3.

⁴³ Guo Yuandan [郭媛丹], “PLA Enters ‘Toughest Exercise Season,’ Exercising Average of Once a Day for Nine Months” [“解放军进入 ‘最强演习季’ 9月平均每天一场”], QQ.com, September 26, 2014.

⁴⁴ Meng Xu [孟旭] and Sun Jingyan [孙景彦], “Filling the Gaps and Taking Training Basics to Their Limits” [“补齐短板夯实训练基础”], *Kongjun Bao*, January 21, 2014, p. 2; Gu Zhiqiang [顾志强], “Breakthrough on ‘Cooperation Cooking,’ New Recruits’ Growth Rapid” [“打破 ‘协煮’ 新兵成长快”], *Kongjun Bao*, February 10, 2014, p. 2; Lu Xiaoke [芦笑珂] and Hou Ningning [侯宁宁], “‘Opponent’ in Evaluation Program Identified” [“考核方案 ‘对手’ 定”], *Kongjun Bao*, September 19, 2014, p. 2.

⁴⁵ “Question and Answer on Policies Related to Winter 2011 Recruitment” [2011 年冬季征兵有关政策问答], Zhejiang University of Technology, undated; “2013 National Policy for Encouraging University Students to Apply for and Undertake Volunteer Military Service” [“2013 年国家鼓励大学生应征入伍服义务兵役政策”], Jilin Jobs, June 25, 2013. We could not find any specific information about the timing of NCO training with regard to the SAM training cycle, but *Science of Air Force Military Training* states that, in general, before officially becoming NCOs, NCOs’ training at dedicated training institutions or institutional professional military education instruction is combined with OJT. After NCOs enter their positions, they participate in OJT at their posts. See Hei Weirong [何为荣], ed., 2006, p. 254.

⁴⁶ “Military Academy’s New Policy in 2015 to Attract Cadets: Previous Years’ Graduates Can Apply” [“2015 军校国防生招生新政：往届毕业生可报考”], Wanjia Education [万家教育], May 4, 2015; “Tutoring Process for 2015 Military Examination” [“2015 年军考辅导流程”], Shenzhou Training Network [神州培训网], December 23, 2014.

PLAAF SAM officers attend the Air Force Engineering University's Air Defense Missile College (防空反导学院) in Xi'an, Shaanxi Province;⁴⁷ they spend three to four years there receiving their basic education and technical training.⁴⁸ The college is responsible for training high-level technical personnel as well as early- to midlevel commanding officers. It is also tasked with helping SAM units train and adjust to new equipment (新装备接改装培训) as well as holding evaluations for short-term group training (短期集训考核).⁴⁹ The SAM officers graduate in June.⁵⁰ In July, they are introduced into the force as newly graduated cadres.⁵¹

Training Guidance

The *Outline of Military Training and Evaluation* (军事训练与考核大纲) is an authoritative document that lays out PLA training foci for the next five to ten years until a new *Outline* is issued.⁵² The previous *Outline* was issued in January 2009. It directed PLAAF SAM units to enhance their capability to deal flexibly with high-technology threats. These include operating under informatized conditions and in complex electromagnetic environments and holding joint operations with other military services and branches.⁵³ Training at night, under adverse weather conditions, and against opposition forces was also emphasized.⁵⁴

By early 2015, the PLA had developed a new trial *Outline*, and select units across the PLA and People's Armed Police were test training its content in 2015. While the full text of the new guidelines was not available to the authors, the Ministry of National Defense carried a summary article with several points that are worth noting. First, the new *Outline* emphasizes the need to

⁴⁷ Yao Wei [姚卫], ed., *China Air Force Encyclopedia* [中国空军百科全书], Vol. 2, Beijing, China: Aviation Industry Press [航空工业出版社], 2005, p. 1245; Air Force Engineering University [空军工程大学], "University Structure" ["院系设置"], undated.

⁴⁸ Hei Weirong [何为荣], ed., 2006, p. 253.

⁴⁹ Air Force Engineering University [空军工程大学], undated.

⁵⁰ An Hongqiang [安红强] and Yang Tao [杨涛], "Quenching the Blade Before Tempering It: Sidelights from Training Experiences of Students from Air Force Engineering University's College of Air Defense and Anti-Missile Studies" ["出炉之前淬淬把火—空工大防空反导学院学员赴部队实习侧记"], *Kongjun Bao*, May 27, 2014, p. 2; Zhao Gang [赵罡], Zhou Ze [周泽], and Chen Zhuo [陈卓], "Genuine Achievements on Training Field" ["演兵场上练真功"], *Kongjun Bao*, June 30, 2014, p. 2.

⁵¹ In one Beijing MRAF SAM division, some new graduated cadres underwent one month of concentrated training followed by three months of grassroots-level mission training. See Zhang Wei [张伟] and Guo Mingming [郭明明], "The First Lesson Before Arriving at Post" ["上好岗前‘第一课’"], *Kongjun Bao*, July 23, 2014, p. 2.

⁵² Kevin Lanzit, "Education and Training in the PLAAF," in Richard P. Hallion, Roger Cliff, and Phillip C. Saunders, eds., *The Chinese Air Force: Evolving Concepts, Roles, and Capabilities*, Washington, D.C.: National Defense University, 2012, pp. 235–254.

⁵³ Liu Xiaohua, Wu Dilun, Liu Feng'an, and Wu Tianmin [刘孝华、吴弟伦、刘逢安、武天敏], "PLA Military Training Is Comprehensively Transforming from Mechanized to Informatized Conditions" ["解放军军事训练由机械化向信息化条件全面转变"], *Sina News*, September 2, 2009.

⁵⁴ Lanzit, 2012, p. 249.

design PLA training subjects based on potential military missions and actual combat environments. Second, it calls for increasing training difficulty and prioritizes the quality of training and focus on precision and details instead of sheer quantity. Third, it calls for innovations in joint training, training at military bases, command training, and night training.⁵⁵

Along with the *Outline*, the Chinese military also formulates five-year plans for major acquisition items related to training. The 12th Five-Year Period Military Training and Reform Overall Plan (“十二五”时期军事训练改革总体方案), which ran from 2011 to 2015, echoes the points above.⁵⁶ Official Chinese media sources reported that the PLA’s 13th Five-Year Plan (2016 to 2020) was published in May 2016.⁵⁷ Of particular importance to SAM units in this plan are discussions of constructing large-scale military training bases and joint PLAA and PLAAF missile operation training sites. An article in *People’s Daily* stated that the joint training sites will allow greater coordination between the two services, including among their respective air defense forces, although the article did not discuss whether the units will actually train together or simply share the same facilities.⁵⁸

Finally, the PLA also provides annual guidance for training, with some consistent themes over the past decade. The 2006 PLA-wide guidance referenced training under actual combat conditions and joint training. PLAAF-specific guidance in 2006 focused on “all personnel, all equipment, comprehensive training, and precise training” (全员全装深训精训). Themes included training under complex electromagnetic environments as well as increasing the intensity of confrontation training, exploring various models of integrated training methods, and increasing the proportion of maritime training and nighttime-tactics confrontation training.⁵⁹ PLA-wide guidance in 2008 called for improvements to joint training, confrontation training, training under complex electromagnetic environments, and live soldier, equipment, and ammunition training.⁶⁰

⁵⁵ This new *Outline* has been under development since April 2013. See Chinese Ministry of Defense [国防部], “All Military New *Outline of Military Training and Evaluation* Has Passed Joint Review” [“全军新《军事训练与考核大纲》完成集中会”], February 6, 2015.

⁵⁶ For a description of the plan, see “General Staff Issues *12th Five-Year Period Military Training and Reform Overall Plan*” [“总参颁发《‘十二五’时期军事训练改革总体方案》”], *PLA Daily* [解放军报], September 23, 2011.

⁵⁷ “Central Military Committee Promulgates *Military Construction Development 13th Five[-Year] Plan Outline*” [“中央军委颁发《军队建设发展‘十三五’规划纲要》”], *People’s Daily* [人民日报], May 13, 2016.

⁵⁸ “PLA Aims at ‘Fighting Actual Wars,’ Will Organize Four Series of Exercises and Drills This Year” [“解放军瞄准‘打真仗’今年将组织4个系列演习演练”], *People’s Daily* [人民日报], February 1, 2015.

⁵⁹ “All-Military Exercise Shows Good Momentum at Start of New Year” [“新年伊始全军军事训练呈现良好势头”], *PLA Daily* [解放军报], February 5, 2006.

⁶⁰ “General Staff Department Sets up All-Military Training Work for 2008; Strengthens Training with Real Equipment and Live Ammunition” [“总参部署全军2008年军训工作 强化实装实弹演练”], China.org.cn [中国网], February 14, 2008.

More recently, the 2014 PLA-wide guidance emphasized the need for training under actual combat conditions, joint training, innovation in combat methods, and using group training and opposition force as main training methods.⁶¹ The 2015 PLA-wide guidance noted two key areas: training of military commanders (指挥员训练) and combat during nighttime (夜战夜训).⁶² It also called for opposition-force training across different military branches, joint training, and training under complex electromagnetic environments as well as under special geographical circumstances and during extreme weather and climate conditions.⁶³

Training Material

Very little has been written in English about PLAAF SAM training material. In Chinese, a number of texts broadly discuss air defense,⁶⁴ but few focus explicitly on SAM tactics and combat methods. The *China Air Force Military Encyclopedia* refers to an official PLA text on SAM tactics published in 2000 that was not available to the authors.⁶⁵ In 2003, the PLA General Staff Department's Mobilization Department published an internal official training reference material, *New Three Attacks Three Defenses Training Knowledge*, for the military reserves on the basics of the new "Three Attacks and Three Defenses." The text goes into detail on the nature of each of these threats and how SAM units should operate individually or in conjunction with other PLA units to counter air threats.⁶⁶

⁶¹ Chinese Ministry of Defense [国防部], "2014 PLA Training Guidance Highlights" ["《2014 年全军军事训练指示》提要"], February 11, 2014.

⁶² "PLA Aims at 'Fighting Actual Wars,' Will Organize Four Series of Exercises and Drills This Year" ["解放军瞄准 准打真仗' 今年将组织 4 个系列演习演练"], 2015.

⁶³ Qiu Yue [邱越], "MOD: Our Military Will Increase Its Modern Conflict Night-Time Combat and Training" ["国防部: 我军将加强现代战争夜战夜训"], *China Daily* [中国日报], January 29, 2015.

⁶⁴ For a sample of the air defense literature, see Xu Guocheng [徐国成], Zhang Baoliang [张保良], and Huang Jinming [黄锦明], *High Technology Air Raid and Air Defense* [高技术空袭与防空], Beijing, China: National Defense University Press [国防大学出版社], 1999; Peng Xiwen [彭希文] and Xue Xinglin [薛兴林], *Air Raid and Anti-Air Raid* [空袭与反空袭], Beijing, China: China Youth Press [中国青年出版社], 2001; Zhong Mingfan [钟明范] and Liu Qianglin [刘强林], eds., *Corps of Air Defense Operations: An Introduction to Typical Cases* [防空兵作战典型战例介绍], Beijing, China: Blue Sky Press [蓝天出版社], 2008; Zhong Mingfan [钟明范] and Liu Bingchu [刘兵初], eds., *Air Defense Operations* [防空作战], Beijing, China: Blue Sky Press [蓝天出版社], 2008; and Chen Jiesheng [陈杰生], *Air Defense Forces Tactical Composite Forces' Operations Research* [地面防空战术混成群作战研究], Vol. 1, Beijing, China: Military Science Press [军事科学出版社], 2010.

⁶⁵ Chen Hongjiu, Guo Youquan, and Wang Yinglong, *People's Liberation Army Air Force Ground-to-Air Missile Force Tactical Study* [中国人民解放军空军地空导弹兵战术学], Beijing, China: Liberation Army Press [解放军出版社], 2000.

⁶⁶ People's Liberation Army Mobilization Department of the General Staff Department [中国人民解放军总参谋部动员部], *New Three Attack New Defenses Training Knowledge* [新三打三防训练知识], Beijing, China: Military Science Press [军事科学出版社], 2003.

Many of the methods mentioned in the above text fall under the 2005 *China Air Force Military Encyclopedia*'s categorization of key PLAAF SAM tactics and combat methods. The *Encyclopedia* contains separate entries for three key combat methods:

- *Maneuvering ambush* (机动设伏): SAM units engage in concealed maneuver to lay traps along potential enemy aircraft flight paths or near key targets in order to strike down enemy air targets without being detected.⁶⁷
- *Close and quick combat methods* (近快战法): As an enemy aircraft nears or enters within range, the SAM unit turns on its target engagement radar and quickly locks onto the target. This decreases the amount of radiation emitted by the SAM unit's guidance radar and limits the ability of enemy aircraft to detect the unit's location.
- *Combat methods of antijamming* (反干扰战法): SAM units employ a variety of measures to eliminate or decrease electronic jamming and counter enemy air targets. These include:
 - use radars of various frequencies and systems to form networks; integrate various methods of intelligence collection and communications; control the time, direction, and frequency of electronic radiation emissions and be able to conceal emission; establish fake radiation sources, emit signals to deceive; correctly use antijamming equipment; flexibly deploy forces, and coordinate main and diversionary attacks; appropriately use firepower from units that face less interference or weapon systems that do not suffer from interference to destroy source of enemy interference.⁶⁸

The *Encyclopedia* views all three combat methods as central to then-current as well as future SAM training. It notes that, because advanced technology increasingly affects a potential adversary's ability to conduct air assaults, maneuvering ambush combat methods are likely to grow in importance. SAM units also will face higher requirements for deceiving and concealing, rapid response and maneuver, avoiding electromagnetic surveillance, and countering jamming.⁶⁹

⁶⁷ Yao Wei [姚卫], ed., 2005, p. 135.

⁶⁸ Yao Wei [姚卫], ed., 2005, p. 136.

⁶⁹ Yao Wei [姚卫], ed., 2005, p. 136.

4. PLAAF SAM Training Activities, 2013–2014

Having laid out the basics of PLAAF SAM training and recent policy guidance, it is important to assess how well the units are training relative to the priority areas and how training is carried out in practice. The authors found only one such recent open-source study relating directly to this issue: In 2010, the National Air and Space Intelligence Center (NASIC) published a study on the PLAAF that devotes four paragraphs to PLAAF SAM training. The NASIC study highlights that PLAAF units have made several training advances since 2000 in “night mobility training, training in an electronic countermeasures environment, and more-complex opposition-force training.”⁷⁰ Beyond this report, most information regarding SAM training comes from news articles that describe one or a couple of training activities.

Methodology

The existing literature leaves significant room for a more in-depth assessment of key trends in PLAAF SAM training. To look at this, we quantitatively analyzed SAM training activities reported in KJB. We supplemented our quantitative analysis by examining additional Chinese- and English-language resources to draw out larger themes and emphases.

2013–2014 PLAAF SAM Training Data

For our quantitative analysis, we constructed a data set containing one year’s worth of articles from approximately 250 issues of PLAAF’s KJB. We read every newspaper from November 1, 2013, to October 31, 2014, to capture a full calendar year of the PLAAF training cycle. We started with November 1, 2013, because, as noted earlier, the PLA’s training cycle used to begin in November before China began implementing changes to the cycle in 2013. While we could have begun coding data from August 2013 to reflect the new training cycle, old PLAAF recruits were still being demobilized according to the old cycle in 2013 (i.e., they were demobilized in November 2013). Coding our data set from November 2013 to October 2014 allowed us to capture one year’s worth of training while avoiding the months of personnel overlap of both new and old recruits (August to October 2013) as the PLA adjusted to its new training cycle in 2013.

KJB is published each weekday for a total of five papers per week. We coded all articles mentioning training activities undertaken by SAM units in 2013 or 2014, which gave us a sample size of 254 entries discussing SAM training. We then differentiated SAM training by size and scope in accordance with previous works.⁷¹ A *basic training* (训练) activity includes basic day-

⁷⁰ National Air and Space Intelligence Center, 2010, p. 91.

⁷¹ National Air and Space Intelligence Center, 2010, p. 65.

to-day training on an individual, subunit, or unit level, generally on one training subject. *Drills* (演练) involve multiple training subjects. An *exercise* (演习) usually occurs at the regiment or brigade level and above and can involve one or more units. It can last a day or more and incorporates the most sophisticated training. Based on these categories, our data had a total of 124 basic training activities, 100 drills, and 30 exercises. We also coded each SAM training activity by the date it occurred and noted which military region participating units belonged to. This allowed us to analyze temporal as well as geographic variations in SAM training.

We focused most of our attention on tracking the content of SAM training. We coded nine categories to capture different key training dimensions:

- *mobility*: long-range mobility or rapid maneuver training
- *opposition-force*: training that involves real or simulated opponents. For example, PLAAF SAM units often train against actual PLAAF aviation unit, and we categorized such training as opposition-force training and not combined-arms training
- *live-fire* (实弹): training that involves live launches of missiles
- *nighttime*: training at night
- *electromagnetic countermeasures (ECM)*: training under conditions of jamming or electronic interference
- *complex physical environments*: involving environment-related challenges, such as difficult terrain or poor weather
- *unscripted*: includes training that did not follow a predetermined script (预案/脚本) or training that was described as involving unknown conditions (未知条件)
- *combined-arms*: training with more than one of the PLAAF's five branches, specifically AAA and aviation, as well as early warning radar, which are not an integral part of a SAM unit. We differentiated this from opposition-force training by coding entries as combined-arms if the other PLAAF branches cooperated with PLAAF SAM units or worked together on the same team/side
- *joint*: training with one or more other PLA service (e.g., PLAA and PLAN). We differentiated this from opposition-force training by coding it as joint training if the other PLA services cooperated with PLAAF SAM units or worked together on the same team/side.

Analysis of Change in Training over Time

We also compared our 2013–2014 data with a secondary data set we coded from English summaries of KJB SAM training articles from January 1, 2004, to December 31, 2006.⁷² At that time, KJB was published only three times a week (Tuesdays, Thursdays, and Saturdays). Given the lower publishing rate, we were only able to code 88 SAM training entries. The low sample size made it difficult to examine the data with the same granularity as our 2013–2014 data; therefore, we opted to use the 2004–2006 data as a point of comparison with our newer data set

⁷² The authors thank Ken Allen for providing these summaries. While we would have liked to code more years of KJB, identifying the relevant Chinese articles and coding the data is a time-intensive process. We opted to leverage the most from existing resources.

to generate indicators for assessing changes in SAM training over time. Per recent PLAAF SAM training guidance, we would expect to see more mobility, nighttime, and opposition-force training in 2013–2014 as well as more complex training (more unscripted, combined-arms, and joint training).

Methodological Limitations

It is important to note that our methodology relies on the quality, content, and nature of the reporting on SAM training found in KJB. In collecting data from KJB, we have built in several assumptions about the coverage of SAM training activities in the newspaper.

First, our analysis generally assumes that the articles printed in KJB are representative of overall PLAAF SAM training, in the sense that the KJB articles discuss a variety of weapons systems and units from all seven former MRs, while featuring many types of training content. However, KJB is an unclassified publication and does not include explicit discussions of sensitive or high-risk issues, including which weapons systems units operate. In KJB and similar unclassified sources, for example, there is limited information on two key SAM exercises: Red Sword (红剑)⁷³ and former Beijing MR's Joint Capital Air Defense (首都联合防空) exercise.⁷⁴ Also, KJB articles identify units only by their former MRAF and not by their specific unit number. We were initially concerned that our data only captured PLAAF units that operated shorter-range and less-sophisticated SAM systems, but were able to confirm later that our data contains activities of units operating China's most advanced SAM systems.⁷⁵

Second, KJB reporting reflects Chinese perspectives on successes, challenges, problems, and opportunities for improvements to SAM training. Since the newspaper's main audience is internal (PLA officers and other service members), KJB articles may exaggerate both the shortcomings and successes encountered during training, both to set an example for other units and to heighten dramatic effect for readers. It is unlikely that KJB reporting consists primarily of

⁷³ Few KJB articles directly name the Red Sword exercise. For example: "Red Sword Culture Induces System Combat Strength on 'War Testing Field'" ["红剑文化催生 '战争实验场' 体系战斗力"], *Kongjun Bao*, December 27, 2011, p. 1; Xu Tongxuan [徐同宣], "Forging a Strong Sky-Space Contingent That Can Achieve Victory" ["锻造能打胜仗的空天劲旅"], *Kongjun Bao*, June 16, 2014, p. 3. There are also limited other official references to it, such as: "Air Force Red Sword Military Exercise, J-10's Breathtaking Interception of J-11" ["空军红剑军演, 歼-10 惊险拦截歼-11"], *Xinhua*, May 7, 2013. A number of KJB articles are likely referring to Red Sword when they describe a system-of-systems opposition-force exercise (ones that usually involve aviation units) that occurs in northwest China and involves Red and Blue teams.

⁷⁴ We only found one reference to the Joint Capital Air Defense exercise, one of China's largest air defense exercises that occur annually, in our 2013–2014 data set. See He Xiaomin [何晓闽] and Yang Yong [杨勇], "Good Company Morals Are Our Company's Tradition" ["好连风是咱连传家宝"], *Kongjun Bao*, February 26, 2014, p. 2.

⁷⁵ Some KJB articles include the names of unit leaders despite not identifying the unit. We searched KJB for every leader that appeared in the *Directory of PRC Military Personalities* who was affiliated with PLAAF SAM units. We then matched the leaders mentioned in KJB with the unclassified Chinese order of battle information in the *Directory*. We were able to identify at least half a dozen entries in our data set that included units that operated longer-range, sophisticated SAMs. See U.S. Department of Defense, 2014.

denial and deception aimed at an external audience given that doing so would confuse most of the newspaper's internal readership. Though some denial and deception may be at play within the paper, it is more likely that the paper showcases either the most advanced training or key improvements and lessons learned to encourage PLAAF readers and portray the PLAAF in the best light. Overall, we found KJB articles to be unusually candid on a number of fronts, including on unit training weaknesses and tactics.

Third, our analysis is informed by the content reported on in KJB, but the reporting is not uniformly comprehensive—descriptions of training may vary from a few sentences to half a page. The newspaper's goal of motivating its audience and demonstrating PLAAF capabilities suggests that KJB is likely to report the most important aspects of each activity, but given that the content of each exercise may not be comprehensive in each article, we do not assume that lack of discussion indicates that PLAAF SAM units are not engaging in such training or that the particular topic is an area of weakness within PLAAF training.

Finally, the lack of precise details, such as the location where the training activity occurred and the date and name of the activity, also makes it difficult—and in many cases impossible—to identify if different KJB articles may be reporting on the same activity. Because there is no reliable method to rule out duplicate reporting, we include and code every account reported. While this raises the question of whether we might be overcounting the most significant and complex training activities, our data include very few cases of more sophisticated exercises, such as those that are combined arms or joint. Instead, the few articles that we identified that appeared to be referencing the same activities each sought to highlight different dimensions of the training.

In sum, our data set should not be viewed as an accurate account of every individual PLAAF SAM training activity within the defined time period, but rather as a useful tool to compare different aspects of SAM training.

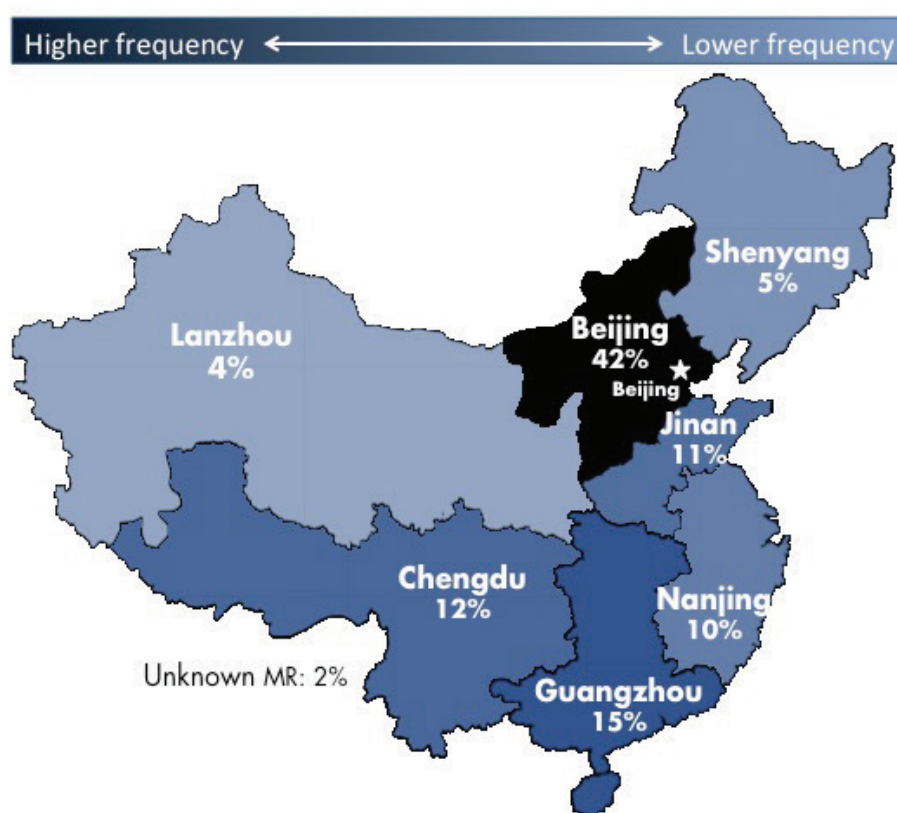
Geographic Indicators of PLAAF SAM Training, 2013–2014

Based on the reporting in KJB, we found that geographically, SAM units from the former military regions where the most sophisticated equipment is deployed held a significant portion of overall PLAAF SAM training from 2013 to 2014. Figure 4.1 maps training activities based on the home location of SAM units and the PLA's former seven military regions. Corresponding with large numbers of PLAAF SAM units equipped with the advanced equipment in the capital area and the importance of the capital air defense mission set for China, the former Beijing MRAF had the largest number of training activities (107 activities) and the most complex, larger-scale training (15 exercises and 31 drills), giving it 42 percent of total training for the year. The former Guangzhou MRAF and former Chengdu MRAF came in second and third, respectively. The former Jinan MRAF, which came in fourth, has relatively few SAM units but is a key region on the Bohai Gulf that is close to the capital; it is also the former MR that is designated to hold experimental training. Contrary to our expectations, the former Nanjing

MRAF came in fifth place (10 percent of the total), even though it has some of the largest numbers of SAM units. The former Nanjing MRAF was ranked third for number of exercises.

Several reasons may explain the unexpectedly low percentage of activities in former Nanjing MRAF. First, reporting on SAM training activities in the former Nanjing MRAF may be too politically sensitive, given the location of the region across from Taiwan and Beijing's push for stronger cross-Straits relations. Second, given the large number of SAM units and the high frequency of sophisticated training activities in the former Nanjing MRAF, it is plausible that the lower-level training to prepare units for exercises may occur but be underreported in KJB.

Figure 4.1. Frequency of SAM Training Activities by China's Former Seven Military Region Air Forces (November 2013–October 2014)



Third, reporting on training may also be low because the figure only shows one year's worth of training, and units within one region may not always have the same annual training opportunities. If we sampled more years of KJB reporting, we might see more training in the former Nanjing MRAF or more uniform training across military regions. We tested this explanation by running keyword searches for any article mentioning PLAAF SAM units and

their home military regions in KJB for six calendar years, from 2008 to 2013.⁷⁶ While we were not able to restrict our keyword search to only articles that discussed training as we did in our 2013–2014 data set, our results showed that former Beijing MRAF units continue to dominate reporting and were discussed in 36 percent of all KJB articles on PLAAF SAMs within the six-year period. We did see a slightly higher proportion of former Nanjing MRAF units (third place at 12 percent) in the broad KJB articles than in our data set (fifth place at 10 percent). This suggests that, although there are some discrepancies in using one year’s worth of KJB data, our data largely aligns with aggregating data across multiple years.

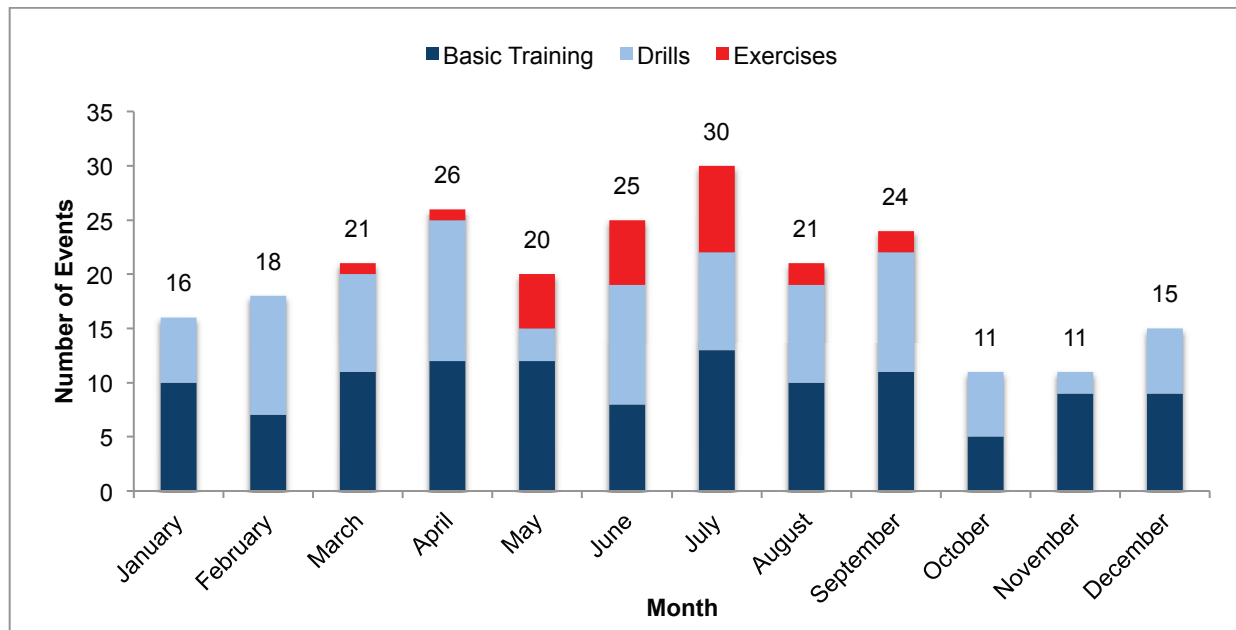
The dominance of former Beijing MRAF in our data raises the question of whether KJB may be over-reporting activities near the capital because the newspaper is headquartered in Beijing. However, the newspaper’s constituency across the PLAAF and its importance for informing and educating PLAAF-wide readership means that KJB is unlikely to neglect major developments in any of the former seven MRAFs. Our 2013–2014 data set included multiple instances of advances and shortfalls in SAM training in geographically diverse locations throughout China.

Temporal Indicators of PLAAF SAM Training, 2013–2014

Temporally, our data show that PLAAF SAM units followed a training cycle in 2013–2014 that began in the fall. Figure 4.2 shows PLAAF SAM training by month, with exercises indicated in red (see page 17 for definitions of basic training, drills, and exercises).

⁷⁶ With a sample size of 1,888 articles, we found 36 percent of the articles discussed former Beijing MRAF units, followed by former Guangzhou (14 percent), former Nanjing and former Chengdu (12 percent), former Jinan and former Lanzhou (9 percent), and former Shenyang (7 percent) MRAF units.

Figure 4.2. PLAAF SAM Training and Exercise Cycle (November 2013–October 2014)



NOTE: The figure does not include 16 entries in the data that did not specify the month in which the training activity occurred.

Figure 4.2 suggests that the 2013 Chinese policy of conscripts joining the force in September affects the training cycle: There were no reported exercises and few basic training and drills from October to February, the early months after new recruits join the military.⁷⁷ Exercises in our data began in March and continued until early fall. There is a high level of training and the highest number of drills in April, presumably in preparation for PLAAF’s flagship opposition-force exercise, Red Sword, which occurs in northwestern China and can involve multiple phases that stretch from late spring to early fall. The high number of drills in April may also be geared at helping second-year conscripts prepare for military academy entrance exams. The peak in exercises (and peak in total training) occurred in July, and high levels of activity were maintained during the summer and early fall.⁷⁸ Based on the training cycle, PLAAF SAM units have different levels of operational readiness throughout the year, with the most notable

⁷⁷ KJB reports training activities at least several days after they occur. This lagged reporting means that events happening at the end of a month may not get reported until the following month. There was at least one exercise (Joint Action-2014E) that PLAAF SAM units participated in in late October 2014 that is not part of our data set.

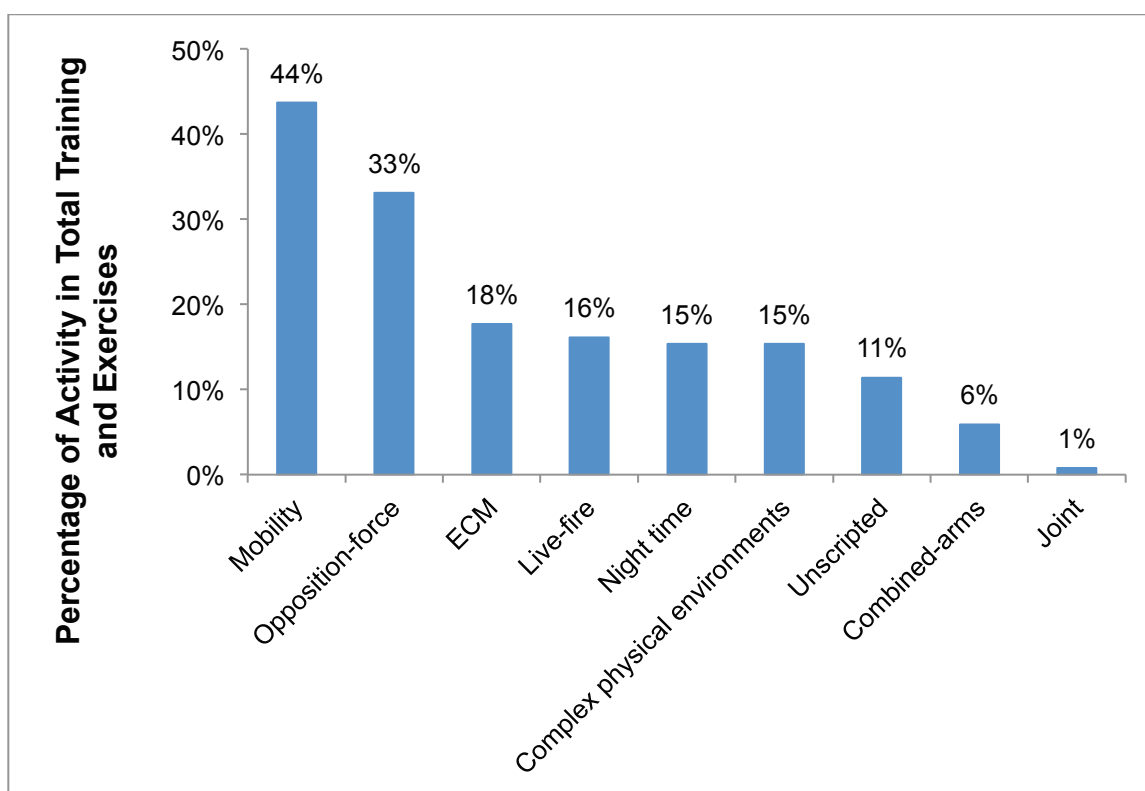
⁷⁸ Currently, there is little evidence that allowing conscripts to join the force in September instead of December has improved military training. One early study comparing results of the training in a coastal defense unit suggests the opposite: The new summer/fall training cycle has led to more injuries among new recruits than the previous winter recruitment date. See Wang Xuerui [王雪蕊], Pang Jianfei [庞剑飞], Li Shangjun [李尚军], Gao Yong [高勇], Yu Zhongming [余仲明], and Wu Shuaipan [吴帅攀], “A Survey and Analysis of the Circumstances Surrounding Injuries and Illnesses of New Enlisted Recruits from Certain Coastal Defense Forces During the Summer/Autumn and Winter Training Periods” [“海防某部夏秋季与冬季新兵入伍训练期间伤病情况调查分析”], *Military Medical Journal of Southeast China* [东南国防医药], Vol. 16, No. 5, September 2014, pp. 558–560.

difference likely being between the beginning of the training cycle in the fall and early winter and the peak training months in the summer.

PLAAF SAM Training Content, 2013–2014

Having laid out the above geographic and temporal variations, Figure 4.3 breaks down training by content. The bars represent the percentage of total training activities that incorporate each type of content. Note that training activities typically include multiple types of content; for example, a single exercise could be coded as having mobility, nighttime, and ECM training.

Figure 4.3. PLAAF SAM Training and Exercise Content (November 2013–October 2014)



In our 2013–2014 data, mobility (44 percent) was the most frequently mentioned. The majority of mobility training was for rapid maneuver, and a minority involved traveling long distances to engage in live-fire training at one of two SAM training ranges in the Gobi Desert or Bohai Gulf or to train in unfamiliar environments. For long distances, SAM units can travel by road, rail, or air.

Opposition-force training (33 percent) was the second-highest category and can be broken down into training against real or simulated opponents. Approximately one-quarter of opposition-force training activities were held against real aviation units. The ratio is lower when

we examine the most sophisticated types of training: Of the 30 exercises in our 2013–2014 data set, only five, or one-sixth of the exercises, involved training against actual aviation units.

However, opposition-force training was mentioned far more frequently than combined-arms or joint training.⁷⁹ Overall, there were few complex training activities in our data set: 11 percent of the entries described unscripted training, 6 percent involved combined arms, and only 1 percent were joint training. Of our 30 exercises, three were unscripted and two were joint exercises (two involved PLAA air defense troops and one also included PLAN air defense units).

PLAAF SAM units appeared to engage in similar levels of training in countering electromagnetic jamming or interference (18 percent), conducting live-fire training (16 percent), training at night (15 percent), and training in complex physical environments (15 percent).

Changes in SAM Training over Time, 2013–2014 Versus 2004–2006

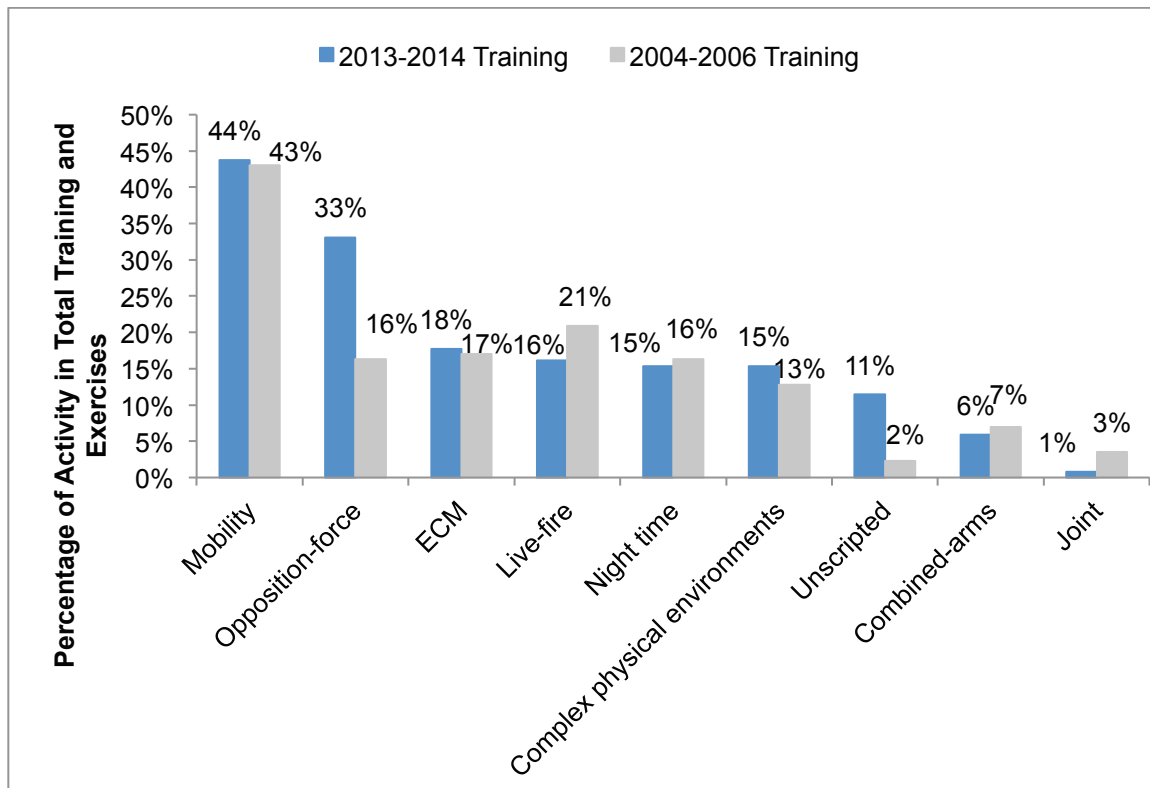
To see how SAM training has changed over time, we compared our 2013–2014 data with the 2004–2006 data. Figure 4.4 presents the change in training over time by comparing the proportion of different training content side-by-side.

It is important to emphasize that our 2004–2006 data set only had 88 entries and was approximately one-third the size of our 2013–2014 data set (which had 254 entries). The differences in data set size make using any single measure of comparison misleading; there are cases in which one type of training content may be a smaller proportion of total 2013–2014 activities but still represent an increase in the actual count of activities that occurred. The figure shows, for example, that combined-arms training decreased by 1 percent when comparing our 2013–2014 data with the earlier data. But since the 2013–2014 data set was significantly larger than the 2004–2006 data, we actually recorded 25 more cases of combined training in 2013–2014 than in the earlier data.

Overall, however, the figure suggests three significant changes over time. First, compared with SAM training from 2004 to 2006, there was a 17-percent increase in the proportion of activities involving opposition force. Second, there was a 9-percent increase in the proportion of activities discussing unscripted training. These two changes are in line with the recent guidance emphasizing more realistic combat training.

⁷⁹ See page 17 for definitions of *opposition-force*, *combined-arms*, and *joint training*. For example, we code PLAAF SAM units training against aviation units as opposition-force training and not combined arms.

Figure 4.4. Changes in PLAAF SAM Training and Exercise Content over Time



Third, there was a 5-percent decrease in live-fire training over time. This proportional decrease, however, does not reflect the fact that our 2013–2014 data had 23 more counts of live-fire training compared with the older data. We also did not find any evidence in KJB that suggests that PLAAF SAM forces were discouraged from engaging in live-fire training in 2013–2014. We do know that such training is expensive and, as one former Chengdu MRAF SAM battalion leader candidly remarked in 2014, SAM units have limited opportunities to engage in live-fire training.⁸⁰ PLAAF SAM systems also have become more sophisticated and reliable, and SAM operators may not need to train as much to validate the weapons. Live-fire training, along with exercises and opposition-force training involving aviation units, also are regarded as major and culminating military training activities *and* do not occur on a frequent basis.⁸¹ The best way to understand the changes to live-fire training is that SAM units still have relatively limited opportunities to engage in live launches.

⁸⁰ Li Ji [李骥], “Who Dares to ‘Con’ Fighting Strength!?” [“谁敢‘忽悠’战斗力!”], *Kongjun Bao*, April 1, 2014, p. 2.

⁸¹ One Chengdu MRAF brigade member, for example, participated in every major military training activity his brigade was involved in for eight years. During those eight years, he took part in approximately 10 missions that were live-fire training, exercises, or system-of-systems opposition-force training. See Yuan Hai [袁海] and Zhou Tengjiao [周腾蛟], “Li Lei: Under Foot, Forever Treading a Long Journey” [“李磊：脚下永远踏征途”], *Kongjun Bao*, December 6, 2013, p. 3.

Aside from these three larger changes over time, there were some small variations but a relatively consistent focus on ECM, mobility, combined-arms, and nighttime training. There was also a slight increase (3 percent of all activities) in training involving complex physical environments and a 3-percent decrease in joint training. With the exception of joint training, which decreased as a percentage of total activities and in actual number (from a count of three to two), the 2013–2014 data set recorded more counts of all the other types of activities.

It is important to note that the relatively low counts of unscripted, combined-arms, and joint training across the two data sets could cause calculations of their percentage change to vary significantly based on one or two observed cases. The decreases shown in Figure 4.4 for combined-arms and joint training should be interpreted with caution and are not necessarily indicative of the overall direction in which PLAAF SAM training is headed.

5. Key Training Themes and Implications

Along with the data presented above, our analysis of PLAAF SAM training revealed four key themes and implications:

- Unit combat training is described as more realistic and challenging.
- Units practice denial and deception, with an emphasis on striking low-altitude targets.
- Units engage in substantial mobility and nighttime training, and some critical weaknesses and limitations still remain.
- There is limited joint and combined-arms training, but units share data and coordinate targeting.

Unit Combat Training Is More Realistic and Challenging

The training activities covered in our 2013–2014 data set indicated a clear focus on PLAAF SAM units conducting more realistic training on multiple dimensions: They engage in more sophisticated training against aviation forces, train without predetermined scripts and in unfamiliar territory, and train longer and under more difficult circumstances.

Units Increased Opposition-Force Training Against Aviation Units; SAM Units Train in Countering Advanced Air Combat Methods

The most significant change is that the proportion of PLAAF SAM opposition-force training has doubled from the mid-2000s (16 percent) to recent years (33 percent). For some SAM units, KJB articles also indicate that training with neighboring aviation units has become more common, with commanders and operators from both types of units spending time learning about one another's combat methods and devising ways to overcome them. SAM units in the former Guangzhou and Nanjing MRs have echoed the importance of training with neighboring aviation units and formed red-blue training relations⁸² or are researching aviation tactics and training against air units.⁸³

The former Beijing MRAF in particular has emphasized cooperation among PLAAF branches in the past two years and organized a series of events titled “Cross-Military Branch Talks” (兵种纵横谈). The talks bring together hundreds of PLAAF military leaders to break

⁸² Zeng Fanlun [曾繁伦] and Ding Yibo [丁义波], “Increase the Proportion of Informatized Conditions in Training” [“加大信息化条件下训练比重”], *Kongjun Bao*, January 14, 2014, p. 2.

⁸³ Chen Wenfeng [陈文锋] and Wang Lei [王累], “Forming a ‘Blue Force’ That Is Not Afraid to Defeat a ‘Red Force’” [“打造敢胜 ‘红军’ 的 ‘蓝军’”], *Kongjun Bao*, July 7, 2014, p. 2.

down barriers among the branches and to achieve greater system integration.⁸⁴ The third lecture of the series was held in late July and August 2014 and brought together 500 officers as well as every leader of a former Beijing MRAF division, brigade, or regiment.⁸⁵

These interactions have led to changes at the local level. A former Beijing MRAF SAM regiment, for example, strengthened its relationship with a neighboring aviation unit that it used to have little communication with. The units now send expert delegations to observe one another's training.⁸⁶ A former Beijing MRAF aviation division leader also led a team to camp out at a SAM regiment for half a month to learn why the aviation unit lost during the last opposition-force training against the regiment. In the next exercise, the aviation units won against the same SAM forces, and both branch units recognized the benefit of not only training against each other, but also exchanging insights about the strengths and weaknesses of different combat methods.⁸⁷

In live-force opposition-force training, PLAAF SAM units also are increasingly challenging their opponents instead of merely "supporting" the other side's training. In PLA exercises, the Red forces represent Chinese forces, and Blue represents the adversary. Traditionally, Red forces—likely for propagandistic and morale reasons—won against Blue forces. Now it is more common for Blue forces to win, though Red forces do still win most of the time.⁸⁸ Across all the training activities, SAM units appear to participate relatively equally as part of the Red (six cases) and Blue (seven cases) teams and, at times, SAM units may be on both Red and Blue teams of system-of-systems opposition-force (体系对抗) exercises. When SAMs are on the Blue teams, they are moving beyond support roles to actively challenge and defeat Red aviation units.⁸⁹

In their training against aviation forces, SAMs are now practicing to counter sophisticated air tactics, and SAM units are operating as part of the Blue force, Red force, or in training activities where there is no clear Blue or Red force distinction. SAM units, for example, are countering Red force aviation units that attack them from low altitude and using natural terrain features for

⁸⁴ "An Increase in Combat Strength Is Generated from Fusing Systems" ["战斗力提升从体系融合上发力"], *Kongjun Bao*, August 12, 2014, p. 1.

⁸⁵ "I Will Push the 'Two Studies' to Promote a Joint and Integrated Sky," ["推进 '双学' 促联合, 纵横天空我担当"], *Kongjun Bao*, August 26, 2014.

⁸⁶ "Breaking the Military Branch Barrier," ["打破兵种壁垒"], *Kongjun Bao*, August 12, 2014, p. 3.

⁸⁷ "Connecting the Combat Capability Nodes," ["打通战斗力经络"], *Kongjun Bao*, August 12, 2014, p. 3.

⁸⁸ Many of the Red-Blue confrontations are still Red forces playing as Blue forces and not necessarily using Blue tactics. See Li Yongqi [李永启], "Not Training to Avoid the Dangerous Is the Only Way to Fight Without Fear," ["练不避危方能战而不惧险"], *Kongjun Bao*, August 8, 2014, p. 2. The article also alleges that in U.S. military training, the fictitious adversary wins over 90 percent of the time, implying that PLAAF opposition exercises are still too easy for the forces being trained.

⁸⁹ Chen Wenfeng [陈文锋] and Wang Lei [王累], 2014, p. 2.

cover (低空突防、利用山体遮掩).⁹⁰ Units also are training against neighboring aviation units (without clear distinction between Red and Blue forces) that engage in low-altitude assaults. These assaults involve two aircraft providing mutual cover and then flying in different directions (采用双机互为掩护, 再编队飞行).⁹¹ A KJB article on a former Jinan MRAF SAM brigade further revealed that SAM units are training against “enemy” aviation units practicing low-altitude mountain/valley flying (低空山谷飞行) as well as extreme low-altitude flying over the far sea (远海低空超低空飞行) in the Bohai Gulf area.⁹²

Units Engage in More Unscripted Training and Training in Unfamiliar Territory

Being able to respond to various circumstances without advanced knowledge or notification also is essential to realistic combat training; PLAAF SAM units are engaged in more unscripted activities as well as training in unfamiliar territory.

With respect to the former, Table 4.4 shows that unscripted training in 2013–2014 represented a 9-percent increase compared with the proportion of unscripted activities in 2004–2006. It is important to note that PLAAF SAM forces are mainly engaging in unscripted training in smaller and less-complex activities. Only three of the 30 exercises in our 2013–2014 data had some unscripted component. Of these three, none involved opposition-force training against real aviation opponents.

In unscripted events, recent articles describe SAM troops as scrambling and, in many cases, initially failing to complete the mission or as being exposed and killed by the adversary. In line with the motivational tone of KJB, units tended to improve their performance over time or their failure exposed critical weaknesses and encouraged them to work harder. While it is difficult to assess how much the PLAAF SAM forces have improved their capabilities since unscripted training began, many of the weaknesses identified in unscripted activities appear to be relatively basic. For example, one article describes a former Beijing MRAF SAM battalion as unable to follow an unexpected order to quickly unload its equipment off the train and arrive at the designated location in 30 minutes. This was because the unit had hastily packed its equipment, and the troops could not remember where they had placed all the components.⁹³

Similarly, PLAAF SAM units also are training in unfamiliar territory (陌生地域) in 9 percent of the cases in our recent data set (22 entries). Such operations often expose the lack of quality in SAM training. One former Nanjing MRAF regiment, for example, scored only a

⁹⁰ Mou Xingguang [牟星光], “Wherever the Mission Goes, the ‘Two Studies’ Expand to Follow” [“任务到哪, ‘双学’ 拓展到哪儿”], *Kongjun Bao*, April 30, 2014, p. 2.

⁹¹ “Connecting the Combat Capability Nodes,” [“打通战斗力经络”], 2014, p. 3.

⁹² Liu Hongchong [刘宏崇] and Liu Hanbao [刘汉宝], “Hammering the Troops into Shape, Normalizing Mobile Combat Capability” [“锤炼部队常态化机动作战能力”], *Kongjun Bao*, May 13, 2014, p. 2.

⁹³ Gan Huan [甘欢] and Fu Zhen [付震], “‘Saving Hassle’: Disrupts Troops’ Ability to Deal with Special Circumstances” [“‘省事’: 乱了特情处置阵脚”], *Kongjun Bao*, July 7, 2014, p. 2.

“satisfactory” score when the unit was taken to an unfamiliar location compared with its usual high marks. The reason was that, when the unit trained at its familiar sites—particularly against a simulated adversary—there was a set location to place the equipment. Troops took shortcuts and did not follow the procedure to calibrate the equipment based on the conditions on the ground, but rather simply entered in data they had memorized from previous training activities.⁹⁴

Units Are Increasing Training Duration and Experimenting with Ways to More Effectively Use All Personnel

Finally, PLAAF SAM units have begun continuous and longer-duration training. The maximum continuous activity mentioned by any recent KJB article in our data was 43 hours, when former Chengdu MRAF SAM troops engaged in long-distance disaster relief efforts, although the humanitarian-relief nature of the disaster indicates that this response likely did not involve the movement of SAM equipment.⁹⁵ The longest continuous training that likely involved SAM equipment was a 24-hour opposition-force training conducted by a former Chengdu MRAF brigade in late July.⁹⁶ The article mentioned that the brigade did not begin 24-hour continuous training until 2014. This suggests that, for this brigade (and perhaps other PLAAF SAM brigades), SAM units were not manned for 24-hour operations prior to 2014 and that the unit is still working to acquire such a capability.

To help deal with the physical toll of the long hours, the former Chengdu MRAF brigade implemented basic role switching, where troops not assigned to combat roles (非战斗岗位人员), such as support personnel, are able to engage in basic operations to keep equipment running and allow the combat troops to rest.⁹⁷ A former Beijing MRAF battalion found itself in a similar situation of having to rely on support personnel when there was a shortage of troops during an exercise in May 2014. Two months after, in July, the battalion organized a basic-training session on operating SAM equipment to train ten types of support personnel, including those responsible for communications, sanitation, security, water, and electricity usage.⁹⁸ Around the same time in July, a former Beijing MRAF regiment began holding activities where it purposely trained with 15 percent fewer troops to encourage troops to have “multiple roles per person” (一人多岗) and

⁹⁴ Chen Tao [陈涛], Zhu Yiping [朱易平], and Wu Yi [伍轶], “Training Field: ‘When Cracking Down on Fakes’” [“训练场, ‘打假进行时’”], *Kongjun Bao*, July 7, 2014, p. 3.

⁹⁵ Tian Yong [田勇], Ma Pingchuan [马平川], and Yuan Hai [袁海], “43 Hours of Continuous Battle” [“43 小时的连续战斗”], *Kongjun Bao*, October 14, 2014, p. 2.

⁹⁶ Yuan Hai [袁海], Zhang Yang [张杨], and Xu Yingyu [许颖钰], “Clearing Battlefield ‘Bottlenecks’ While Practicing Continuous Resistance” [“解战场 ‘瓶颈’ 练连续抗击”], *Kongjun Bao*, August 1, 2014, p. 2.

⁹⁷ Yuan Hai [袁海], Zhang Yang [张杨], and Xu Yingyu [许颖钰], 2014, p. 2.

⁹⁸ Wang Hongbin [王洪宾], “Sweep Away Common Hardworking Members’ Training ‘Blind Spots’” [“扫除公勤员训练 ‘盲区’”], *Kongjun Bao*, July 25, 2014, p. 1.

“one specialty but many capabilities” (一专多能).⁹⁹ This change corresponds to efforts that the PLAN has been implementing since the early 2000s to encourage Chinese naval personnel to have more than one skill in order to fill in for those who are absent due to injury, death, or vacation.¹⁰⁰ It is unclear if similar efforts existed in the PLAAF before, but such efforts would correspond to the trend that newer SAM systems are more reliable and sophisticated and may thus need less people to operate than older systems.

Units Practice Denial and Deception, with an Emphasis on Striking Low-Altitude Targets

SAM units are also training to improve denial and deception capabilities via the combat methods noted earlier: maneuvering ambush, close and quick tactics, and antijamming combat methods. With respect to the first combat method, we identified more than half a dozen KJB articles in our 2013–2014 data set in which SAM units laid traps and waited to lure in enemy aircraft. This was made clear in a KJB article that described a Beijing MRAF composite unit setting up physical decoys in rows, while actual SAM units were dispersed in the area.¹⁰¹ As enemy surveillance aircraft neared, the unit released smoke in an attempt to prevent the enemy aircraft from discovering the decoys. Later, after the surveillance aircraft left the area, two enemy fighter aircraft arrived to attack the decoys and were shot down by SAM units.¹⁰² A separate article on a Chengdu MRAF battalion further describes PLAAF SAM forces as experimenting with deception measures beyond visual concealment: Troops also used electronic deception and turned on heaters to conduct infrared deception.¹⁰³

In terms of maneuvering patterns, most articles describe SAM units as moving their location more than once in each training activity. Our recent KJB data reported that the largest number of SAM maneuvers to change location (机动转移) occurred during an opposition-force exercise in the summer of 2014 in northwest China, when a former Nanjing MRAF SAM brigade changed

⁹⁹ Su Yuansheng [苏垣生] and Guan Huan [甘欢], “‘One Specialty, Many Capabilities’ Popular on the Training Field” [“‘一专多能’ 走红演训场”], *Kongjun Bao*, July 21, 2014, p. 1.

¹⁰⁰ Wan Daojun and Yang Xiangchun, “Returning Home with a Win, an Award and Money,” *People’s Navy* [人民海军], August 12, 2003, p. 1; and Liu Guangliang and Li Yongfei, “Company Specializing in ‘Generalists’ Props Up Communications Command’s ‘Skynet’” [“一连专业 ‘多面手’ 撑起通信指挥 ‘天网’”], *Huojianbing Bao* (Rocket Force News) [火箭兵报], December 20, 2006, p. 1.

¹⁰¹ The article did not detail if the units engaged in other types of electronic or infrared deception.

¹⁰² This article did not fall within our data range, and it was not one of our coded cases. See Li Long [李龙] and Zhang Lei [张雷], “Guided Missile ‘Going Invisible’ in Desert” [“导弹大漠 ‘隐身’ 记”], *Kongjun Bao*, September 30, 2013, p. 2.

¹⁰³ Ma Pingchuan [马平川] and Wang Jian [汪健], “Li Xinzheng: Thinking About the Enemy’s Situation at All Times” [“李新征：脑中时刻有敌情”], *Kongjun Bao*, December 6, 2013, p. 3.

positions more than 20 times and likely over multiple days.¹⁰⁴ While there is no reporting in KJB on how many regular launch sites each SAM unit has, the PLA—given China’s detailed lessons learned from the war in Kosovo—is likely to be as prepared, if not more, than the Yugoslavian troops. According to an authoritative Chinese study of the war in Kosovo, Yugoslav missiles units “would usually have four to five reserved positions and would change their position every three to four hours. After launching, they would immediately change their position to a new one 1,000 meters away.”¹⁰⁵

In contrast to Kosovo SAM reserve positions, KJB articles suggest that PLAAF SAM reserve positions may be numerous and potentially dozens of kilometers away. One article described a rapid mobilization and opposition-force training that stretched 50 kilometers from a former Nanjing MRAF SAM brigade’s home base to its backup site. The unit had to take a detour because the normally used route to the backup site was blocked.¹⁰⁶ This suggests that, while the backup site is likely less than 50 kilometers away if the normal route was available, the site may still be dozens of kilometers from the brigade’s home location. In other articles, KJB describes the amount of time units were allocated to move between locations. For example, a former Chengdu MRAF SAM brigade was instructed to move to its second position within one hour and immediately began disassembling its equipment.¹⁰⁷ A former Nanjing MRAF brigade was dispersed in the mountain and in position 30 minutes after an emergency alarm indicated enemy aircraft had appeared.¹⁰⁸

Relative to the other two combat methods, KJB articles explicitly describe SAM forces turning their radars on and off to avoid detection and using multiple radars to relay detected targets. A KJB article, for example, depicts an exercise where an enemy assault took down a radar nearby and, as the enemy flew closer, the SAM unit turned on its own target engagement radar (制导雷达) to fire on the aircraft.¹⁰⁹ In a drill by a former Nanjing MRAF battalion, the

¹⁰⁴ For the reporting on 20 location changes, see Zeng Fanlun [曾繁伦], “The Training Field No Longer Has Unbalanced Focus on ‘Uniformity’” [“演练场不再片面强调‘整齐划一’”], *Kongjun Bao*, September 29, 2014, p. 2. This exercise is likely the same as a long-distance, live-fire, opposition force exercise a Nanjing MRAF brigade engaged in July 2014 that was also reported in a July 22, 2014 KJB article. The July KJB article had noted that the exercise started on 11 July and the SAM units had already changed positions more than ten times. This suggests that the exercise was multiday, perhaps even lasting more than a week. The SAM units likely changed positions multiple times per day and the more than 20 position changes reported in September likely spanned multiple days. See Cao Jinjun [曹进军] and Zeng Fanlun [曾繁伦], “This Fight Does Not Leave ‘Buffer’ Time” [“这次战斗不留‘缓冲’时间”], *Kongjun Bao*, July 22, 2014, p. 2.

¹⁰⁵ *Research into the Kosovo War*, p. 105.

¹⁰⁶ Gu Xiangnan [顾香楠] and Wang Hu [王虎], “This Type of Pulling Movement Is ‘Just Right’” [“这样的拉动‘真够味’”], *Kongjun Bao*, March 12, 2014, p. 3.

¹⁰⁷ Tian Yong [田勇] and Xu Yingyu [许颖钰], “Rumbling Testing Fields: ‘Seamlessly’ Integrating with Battlefields” [“滚动考场：与战场‘无缝’接轨”], *Kongjun Bao*, November 22, 2013, p. 4.

¹⁰⁸ Zeng Fanlun [曾繁伦], 2014, p. 2.

¹⁰⁹ Liu Yang [刘洋], “In No Man’s Land” [“在无人区”], *Kongjun Bao*, May 19, 2014, p. 4.

unit was explicitly instructed to first turn on its target acquisition radar (目标指示雷达) to search for targets. After a target was detected, troops reported it to the battalion commander, and the commander provided the target indicators to SAM target engagement radars.¹¹⁰

Units Undergo Significant Training to Engage Adversaries Flying at Low and Extreme Low Altitudes

SAM units are using these combat methods to target adversaries at low altitude (低空) or extreme low altitude (超低空).¹¹¹ KJB articles describe hitting lower-altitude targets as more technically challenging than striking higher-altitude targets, and attaining this capability is a training priority. Though it is possible that KJB articles may be referring to altitude colloquially, it is likely that their discussion of altitude corresponds to the PLA's definitions of operational air space. We therefore reference PLA air defense definitions of altitude.¹¹² In our recent data set, 29 articles mentioned specific targets SAM units attacked or defended against. Seventeen, or more than half of the articles, mentioned that SAM units were focused on defending against enemy assaults at low altitudes (between 100 and 3,000 meters). Nine articles noted the need to counter assaults from extreme low altitudes (100 meters and below). In contrast, only one article about a Chengdu MRAF SAM brigade described hitting a target at medium to high altitude. Across all the KJB articles we read, some of these lower-altitude targets were specified as:

- small, slow, and low-altitude moving objects (低慢小)¹¹³
- gliding, low-altitude, and slow-moving objects
- fast-moving objects with low radar cross-section, or RCS (目标速度快, 反射面积小)¹¹⁴
- U.S.-designated fourth-generation combat aircraft¹¹⁵

¹¹⁰ Zeng Fanlun [曾繁伦] and Ding Yibo [丁义波], "Adapting to Change by Changing" ["以变应变"], *Kongjun Bao*, April 16, 2014, p. 2.

¹¹¹ During the founding phase of PLAAF SAM units from the 1950s to 1970s, China was mainly concerned with countering the threat of high-altitude air assaults (高空空袭威胁). From the early 1970s to the mid-1980s, China became aware of the growing threat of low-altitude surprise air attacks (低空突防威胁). Internationally, the 1973 Arab-Israeli War, as well as the 1982 Falklands/Malvinas War, led to innovations in SAM tactics to counter electromagnetic resistance and target enemy forces flying at low altitude. These conflicts emphasized to the PLA the importance of enhancing SAM coordination with aviation units to maintain air superiority and the need for its SAM units to improve their ability to strike targets at low altitude and extreme low altitude. See Yao Wei [姚卫], ed., 2005, p. 133.

¹¹² According to *PLA Military Terminology*, the operational air space of air defense forces (防空兵) can be categorized into several altitudes: extreme low-altitude airspace (超低空空域) (less than or equal to 100 meters, or 328 feet), low-altitude airspace (低空空域) (100 to 3,000 meters, or 328 to 9,843 feet), medium-altitude airspace (中空空域) (3,000 to 15,000 meters, or 9,843 to 49,213 feet), and high-altitude airspace (高空空域) (above 15,000 meters, or 49,213 feet). See People's Liberation Army, 2011. p. 753. This is different from PLAAF's definitions of aviation altitudes; see p. 994.

¹¹³ Cao Jinjun [曹进军] and Zeng Fanlun [曾繁伦], 2014, p. 2.

¹¹⁴ Zhang Wei [张伟] and Yin Zongyang [尹宗洋], "Man and Sword Aiming at the Blue Dome of Heaven as One" ["人剑合一指苍穹"], *Kongjun Bao*, August 1, 2014, p. 3.

- missiles
- unmanned surveillance aircraft.¹¹⁶

The listed targets are not necessarily mutually exclusive, and the most frequently mentioned among these targets are small, slow, low-altitude objects.¹¹⁷ The 2013–2014 KJB articles neither explicitly stated what each of these targets were nor how SAM units simulated any of these targets in their training. It is likely that these targets correspond to the PLA’s concept of “three attacks” (attack stealth aircraft, cruise missiles, and armed helicopters) and “three defenses” (defend against precision strikes, electronic jamming, and electronic reconnaissance and surveillance).¹¹⁸ There is also evidence that PLAAF SAM units have used small aircraft models in their target training.¹¹⁹

SAM units also are practicing against several types of low-altitude assaults in addition to the sophisticated air tactics described earlier that opposing aviation aircraft are using to engage with SAMs:

- near-continuous assaults with a limited amount of time elapsing (小间隔，连续进袭)¹²⁰
- saturation attacks involving multiple waves of aircraft (多批次大机群饱和攻击)¹²¹
- multidirectional assaults from adversary special forces (敌特分子多方位突袭).

There is little description on how these attacks are simulated in practice.

It is important to note that SAM units operating short- and medium-to-long-range missiles are engaging against lower-altitude targets and assaults. Some of these SAM units possess both longer- and shorter-range missiles. Others are using long-range assets to strike some of the targets listed above.¹²² In 2010, for example, a former Chengdu MRAF SAM brigade was

¹¹⁵ These are designated as third-generation aircraft in Chinese.

¹¹⁶ Yuan Hai [袁海] and Zhou Tengjiao [周腾蛟], 2013, p. 3.

¹¹⁷ One air force expert, for example, speculated that the small, slow, low-altitude moving objects might be cruise missiles.

¹¹⁸ Slow, small, low-altitude objects may be referring to helicopters or drones. Fast-moving, low altitude could be referring to cruise missiles. Fast-moving, medium-high altitude may be referring to fighters. Gliding objects may be referring to a non-powered slow bomb such Joint Direct Attack Munitions or Small Diameter Bombs. Fast-moving, low-RCS could be referring to bombers and fast-moving, low altitude could be referring to B-2s at stand-off distances over the water.

¹¹⁹ *Kongjun Bao*, article title not known, February 8, 2003, p. 1.

¹²⁰ Li Jin [李进], Zhang Yongfeng [张勇峰], and Cui Wenbin [崔文斌], “Don’t Try to ‘Win Points’ for Drills, Just Try to Win ‘First Prize’ During Wartime” [“不为演练争‘彩头’，只为战时赢‘头彩’”], *Kongjun Bao*, July 2, 2014, p. 2.

¹²¹ Ma Pingchuan [马平川] and Wang Jian [汪健], 2013, p. 3.

¹²² Meng Qingbao [孟庆宝], “Stick to Actual Combat Training, Improve Core Capabilities” [“紧贴实战训练，提升核心能力”], *Kongjun Bao*, June 12, 2014, p. 1.

reported to be the first to use a new type of domestically produced longer range SAM to destroy a low-RCS target.¹²³

Units Engage in Substantial Mobility and Nighttime Training and Some Critical Weaknesses and Limitations Still Remain

Logistical Problems Decrease Units' Readiness and Ability to Quickly Move to Designated Locations

Both of our data sets show that PLAAF SAM troops incorporate substantial levels of long distance and rapid mobility into their training. Logistics problems, however, appear to plague the ability of SAM units to move to designated locations and be combat ready upon arrival. Units recognize that bringing significant numbers of support vehicles diminishes mobility. One former Chengdu MRAF brigade, for example, revised its logistics and support procedures four times in recent years to simplify its supply needs. Its late 2013 reforms allowed it to eliminate at least one support vehicle per company (for a total of more than ten vehicles for the entire brigade) by encouraging troops to put their supplies in SAM equipment transport vehicles. This measure reportedly decreased the length of time the brigade required to pack and move its supplies from one location to another by one-third.¹²⁴

While new measures allowed vehicles to move quicker between locations, they did not necessarily facilitate combat readiness. A July 2014 article about a former Guangzhou MRAF SAM brigade described troops stuffing their supplies into any available space in equipment-transport vehicles. This created a problem when the vehicles reached the training site, because when troops needed to use their equipment, they often had to unload support supplies first. This lengthened the time troops needed to locate and assemble their equipment.

In response to this new problem, the same brigade began experimenting with a more “modular” logistics system, in which support supplies would be calculated on a per-person basis more scientifically. In one drill, the unit found that the modular system cut the time troops spent on unloading and loading supplies and equipment by 45 minutes.¹²⁵ While it is unclear if this system is unique to this particular brigade or has been applied nationally, this and other articles suggest that SAM units are still trying to find the right balance between bringing sufficient supplies and being able to deploy rapidly.

¹²³ “PLA New-Type Surface-to-Air Missiles for the First Time Hit Small Targets with Reflective Surfaces During Actual Combat” [“解放军新型地空导弹首次实战命中小反射面目标”], *Sina News*, October 13, 2013.

¹²⁴ Yuan Hai [袁海] and Hu Xiaoyu [胡晓宇], “Cutting Off the ‘Tail’ Helps Mobility” [“砍掉‘尾巴’促机动”], *Kongjun Bao*, December 20, 2013, p. 1.

¹²⁵ Zhang Yongjun [张勇军] and Chen Wenfeng [陈文锋], “Modularization Safeguards and Upgrades the Efficiency of Mobile Preparations” [“模块化保障提升机动准备效率”], *Kongjun Bao*, July 30, 2014, p. 2.

Similarly, SAM units are struggling to deploy in response to unannounced orders or simulated surprise enemy assaults. One KJB article describes that often, when speed was emphasized, troops skipped steps and did not follow standard procedures for dismantling and moving equipment, causing sensitive equipment to be damaged and unusable.¹²⁶ At other times, in an example mentioned earlier, SAM troops were not able to unexpectedly switch from one transportation method (in this case, a train) to a different type of vehicle in a time-efficient manner because of the problems they had in packing and storing their equipment and supplies.¹²⁷

Units Are Improving Their Ability to Conceal and Avoid Detection When on the Move

SAM units are still working on concealing their movements and operations. One area of needed improvement identified is sufficient dispersal when SAM units are moving between locations.¹²⁸ Some units still have large footprints, and articles describe the movement of large numbers of support vehicles accompanying units in a long column resembling “one long dragon.”¹²⁹ This formation, with its large number of support vehicles, makes units easily detectable and decreases their mobility. Problems identified by KJB in the mid-2000s included deploying as a group and always driving on the same roads. Ten years later, these issues appear to persist among a minority of the units. Multiple KJB articles note that some units have discarded this practice and require troops to separate into smaller echelons and take different routes to reach the same destination.¹³⁰

Along with dispersal during movement, KJB also describes some work toward concealing equipment when moving. An article on a former Beijing MRAF SAM regiment notes that previous concealment efforts applied to SAMs only in a resting state (静态) and the equipment often required a relatively long time to be operable once exiting the resting state. The unit developed innovative measures to allow equipment to be concealed while fully operable, with the result that the only two pieces that could not become completely camouflaged were the launch stand and the command and control antenna.¹³¹ The new concealment technique practiced

¹²⁶ Chen Tao [陈涛], Zhu Yiping [朱易平], and Wu Yi [伍轶], 2014, p. 3.

¹²⁷ Gan Huan [甘欢] and Fu Zhen [付震], 2014, p. 2.

¹²⁸ Bao Dehua [包德华] and Mu Lin [穆琳], “Deep Inquiry into the Difficult Problems Surrounding the Generation of Fighting Strength from New Equipment” [“围绕新装战斗力生成难题专攻精练”], *Kongjun Bao*, October 15, 2014, p. 2.

¹²⁹ An Ning [安宁] and Yang Danpu [杨丹谱], “Move as Swift as the Wind, Well-Trained and Prepared” [“动若风发, 精练实备”], *Kongjun Bao*, April 29, 2014, p. 1; Yuan Hai [袁海] and Hu Xiaoyu [胡晓宇], 2013, p. 1; Hu Huasong [胡华松], “‘One Long Dragon’ Style Military Movement Has Disappeared” [“‘一条龙’式行军不见了”], *Kongjun Bao*, July 23, 2014, p. 1.

¹³⁰ Yi Shangmin [衣尚民] and Fu Zhen [付震], “The Ability to Achieve Victory While Being Shaped by a Complex Environment” [“在复杂环境中砥砺能打胜仗本领”], *Kongjun Bao*, February 18, 2014, p. 1.

¹³¹ Feng Zhe [冯哲] and Zhang Linda [张林达], “Opportunely Deploying a Maze to Create the ‘Skynet’” [“巧布迷阵织‘天网’”], *Kongjun Bao*, June 13, 2014, p. 2.

by this regiment reportedly reduced the probability of visual detection, but it is unclear how well it worked to reduce other signatures, as well as whether or not other units have embraced this method.

Safety Is a Serious Concern and Limitation on SAM Training

Safety is a serious concern for the PLA at large and more specifically for its air defense forces. A Chinese study of nearly 2,500 new PLA recruits showed that approximately one-fourth to one-third of the new soldiers were injured during the first couple of months of training.¹³² Among the various types of PLAA forces and including both new and experienced soldiers, a 2014 study ranked air defense forces as the third most likely to be injured group (after foot soldiers and artillery troops), with an injury rate of almost 15 percent.¹³³ While the study did not include PLAAF air defense units, it does suggest that air defense troops operate in environments where the risk of injury is relatively high.

SAM units are generally wary of engaging in difficult or complex training activities that risk the safety of their troops. As a result, units may impose limitations on the training they engage in, though these limitations may vary from unit to unit. For example, one article on a former Nanjing MRAF SAM regiment described that risk of injury was a major concern and the reason that one of their battalions does not practice ground assaults or harassments or special circumstances (such as tires being stuck in a ditch) when moving between locations. Some of the battalion's troops have joked that their mobility training is far from actual combat and more like driving the equipment around in a loop. The KJB article further described this concern over safety as one that other units share, and some units would prefer to be safe than win praise or recognition for their training.¹³⁴ This article, as well as others, however, urges PLAAF SAM troops to engage in more realistic and difficult combat training to overcome and resolve safety concerns.¹³⁵

¹³² The study sample included PLAA foot soldiers, PLAAF airborne forces, and PLAN ground-based units. See Long Yong [龙泳], Li Yuanguai [李远贵], Li Liangshou [李良寿], Sun Changshen [孙长生], Zou Shengting [邹声听], Zhu Wenqiang [朱文强], Chang Yaoming [常耀明], and Yang Hongyuan [杨洪源], "A Epidemiological Survey of Military Training Injuries Suffered by New Recruits from Ground, Naval, and Air Forces During the Basic Training Period" ["陆海空新兵基础训练期间军事训练伤的流行病学调查"], *Medical Journal of National Defending Forces in Northwest China* [西北国防医学杂志], Vol. 21, No. 4, 2000.

¹³³ Cai Yuxiang [蔡玉祥], He Jianbang [何建邦], Liu Weichun [刘伟春], and Zhang Tao [张涛], "Characteristic Patterns and Response Measures for Training-Related Injuries in the Armed Forces" ["部队发生训练伤的特点规律及应对措施"], *Military Medical Journal of Southeast China* [东南国防医药], Vol. 16, No. 4, July 2014, pp. 447–448.

¹³⁴ Chen Tao [陈涛], Zhu Yiping [朱易平], and Wu Yi [伍轶], 2014, p. 3.

¹³⁵ Other articles, for example, include Xu Yingyu [许颖钰] and Yuan Hai [袁海], "Training Doesn't Have Breaks" ["训练没有间歇期"], *Kongjun Bao*, December 26, 2013, p. 1; Fu Jingjie [付景杰] and Xu Wenjie [许文洁], "Breaking Chains, Bravely Crashing Through Obstacles" ["解开枷锁勇闯关"], *Kongjun Bao*, July 16, 2014, p. 1; and Bao Dehua [包德华] and Zhang Kaiyuan [张开元], "At Midnight, Sharp Swords Strike" ["子夜，利剑出击"], *Kongjun Bao*, July 31, 2014, p. 1.

Units Are Engaging in More Complex Night Operations but Have Varying Degrees of Capability to Operate at Night

Despite the PLAAF's decade-long emphasis on night training, Chinese sources repeatedly discuss combat at night as a challenging training subject.¹³⁶ The weaknesses identified by KJB in the mid-2000s still exist in the force, although there has been some progress. Although a good proportion of night training now appears to occur late at night, and sometimes even continuously throughout the night, a number of units are not training at such levels. One article described the problem with night training as related to safety: Instead of risking casualties, some units trained at "night" by carrying out activities at dusk or dawn. Units may also engage in night "training" by encouraging troops to practice within their vehicles.¹³⁷ Perhaps the most innovative were methods that a former Beijing MRAF SAM battalion implemented to increase the safety of driving late at night to the detriment of concealment and rapid mobility: The battalion added antislip chains to all the vehicles, attached reflective sheeting to all SAM equipment, and had all their vehicles drive in a line one after another.¹³⁸

We are unable to confidently assess the ability of PLAAF SAM units to engage in complex night operations, but units appear to be introducing more complexity into their night training. Our 2013–2014 data set recorded only two incidents of opposition-force training against aviation units at night. These two drills, however, were divided into multiple phases that stretched across day and night, and it was not clear that opposition-force training against actual air units occurred at night.¹³⁹ Our data set does include 13 other cases where some form of opposition-force training occurred at night. None of these explicitly mentioned actual aviation units, but these training activities may have involved some degree of complexity. For example, in one nighttime drill, a former Beijing MRAF battalion engaged in defensive and offensive opposition-force and rapid-fire training.¹⁴⁰ A different former Beijing MRAF composite division battalion also engaged in a large, unspecified important nighttime mission. This battalion had also at some point trained within their vehicle on how to strike fast-moving, low-RCS objects at night.¹⁴¹ Regardless of the degree of complexity of PLAAF SAM night operations, PLAAF SAM units routinely practice nighttime equipment assembly and tear down, as well as nighttime long

¹³⁶ Ji Xiangbo [吉相波] and Zhou Yu [周羽], "Training a 'Soft Underbelly' to Become Firm" ["把 '软肋' 练硬"], *Kongjun Bao*, July 29, 2014, p. 4.

¹³⁷ Chen Tao [陈涛], Zhu Yiping [朱易平], and Wu Yi [伍轶], 2014, p. 3.

¹³⁸ Feng Zhe [冯哲] and Feng Honghua [冯宏划], "Mobility on Rainy Nights" ["夜雨机动"], *Kongjun Bao*, May 30, 2014, p. 4.

¹³⁹ Yi Shangmin [衣尚民] and Fu Zhen [付震], 2014, p. 1; and Yuan Hai [袁海], Zhang Yang [张扬], and Xu Yingyu [许颖钰], 2014, p. 2.

¹⁴⁰ Li Anfu [李安福] and Liu Xin [刘欣], "Combined Training, Day and Night" ["昼夜合训"], *Kongjun Bao*, September 15, 2014, p. 2.

¹⁴¹ Zhang Wei [张伟] and Yin Zongyang [尹宗洋], 2014, p. 3.

distance and rapid mobility with SAM equipment. This would facilitate their ability to relocate at night without detection by electro-optical sensors.

Looking beyond KJB, there are also some examples of PLAAF units involved in large and complex exercises that have a significant night component. One example is Joint Action-2014E, a late October 2014 exercise in the former Shenyang MR that was the largest joint PLAAF and PLAA exercise in 2014 and one of the PLA's highest-priority and highest-profile training events of the year. This exercise involved at least one night of opposition-force training between the various Red forces and a Blue adversary, as the Red force was engaged in long-distance mobility to travel to the main exercise location. One of the Red ground-force echelons failed to conceal its movement and drove through the night with its vehicles' bright lights on. While there is little information available to determine whether this unit was a PLAAF SAM unit or other PLAAF or PLAA forces, this exercise does show that the PLA is trying to enforce strict light discipline—with varying degrees of success—when units are operating at night.¹⁴²

There Is Limited Joint and Combined-Arms Training, but Units Share Data and Coordinate Targeting

Finally, KJB contained few articles discussing SAM units engaging in joint or combined-arms training. It is easier for SAM units to train against aviation units or other PLA forces than to train on the same side. PLAAF SAM leaders are recognizing the increased need to coordinate military actions between SAM troops and other military branches as well as among SAM units. The former Beijing MRAF's 5th SAM Division, for example, has changed its training evaluation criteria to reflect this priority. For each SAM unit, now only 40 percent of its training score is based on its own individual performance, and 60 percent of its score is based on its ability to coordinate with other firepower units or control units.¹⁴³

There are indications that PLAAF SAM units—and other ground-based air defense units in the PLAA and PLAAF—are moving away from holding simple altitude deconfliction with aviation units and communicating with one another to better combine forces against adversaries. This change is highlighted when comparing a 2012 exercise with a 2014 one. In a 2012 air-land exercise, two waves of enemy aircraft attacked Red forces, one from a higher altitude and one from a lower altitude. Red aviation units responded to the higher-altitude assault, while Red SAM and AAA forces attacked the lower-altitude target. When the Red ground-based air defense forces needed air support, they could not communicate with the Red aviation aircraft fighting in

¹⁴² “Bohai Drills, Agitation Amidst Happiness” [“渤海演兵，欣喜之中存忧思”], *Advance News* [前进报], November 5, 2014, pp. 1, 3. KJB also carried one article describing a Guangzhou AAA unit as strictly enforcing no use of lights at night even when the unit had to divert from its normal path to utilize an alternative path. See Bao Dehua [包德华] and Zhang Kaiyuan [张开元], 2014, p. 1.

¹⁴³ Lu Xiaoke [芦笑珂] and Hou Ningning [侯宁宁], 2014, p. 2.

the air. Though SAM and AAA forces were able to strike down two low-altitude attacking aircraft, they suffered significant losses.¹⁴⁴

In contrast, in Joint Action-2014E, the ground-based air defense forces—which may have included SAMs from the PLAAF as well as the PLAA¹⁴⁵—could communicate with PLAAF aviation aircraft via a “new coordination station” (新型协同电台) and a “data receiving vehicle” (数据接入车). When enemy aircraft attacked, Red ground-based units could call for air support: Red aviation units engaged with the Blue aircraft in the air, and ground-based air defense units used two new types of SAMs to engage the same Blue aircraft. The air-ground cooperation successfully downed four Blue aircraft.¹⁴⁶ There were no electromagnetic interference or disruptions in communications in this phase of the exercise.¹⁴⁷

Despite such changes, there is little to suggest that the PLAAF has made significant progress toward operating fighter interceptors and SAMs in the same airspace—a Joint Engagement Zone. We did not find any discussion in our KJB data set of SAM units training to identify friend or foe (敌我识别) or aircraft flying through certain corridors in a Missile Engagement Zone. Looking beyond our data set and PLAAF SAM training, however, we found discussions and examples of the PLA’s inability to do so. In 2015, PLAA ground-based forces were not able to recognize their own helicopters and engaged in deception and concealment as the helicopters took off.¹⁴⁸ Looking back further, in an exercise held in the former Chengdu MR in 2010, PLAA Red SAM units shot down their own Red surveillance aircraft as the aircraft was heading back to the defended zone, despite the aircraft’s attempts to send electronic signals to identify itself. This exercise demonstrated that the PLA’s preferred way to identify aircraft is through cooperative target recognition methods: to use its Identification of Friend or Foe system to engage in electronic interrogation prior to engagement. Should electromagnetic interference prevent transmission of information, the PLA then relies on noncooperative target recognition approaches that involve inputting the target’s characteristics and basic data into a database to make a judgment call.¹⁴⁹

¹⁴⁴ “Integrated Joint Operations Start with ‘One’” [“一体化联合作战从‘一’做起”], *PLA Daily* [解放军报], November 20, 2014.

¹⁴⁵ It is unclear if PLAAF SAMs were involved in this particular engagement in the exercise.

¹⁴⁶ It is unclear if downing four Blue aircraft is a significant measure of success. Instead, this should be interpreted as developmental testing of the “new coordination station.”

¹⁴⁷ It was also not clear how the Red ground-based forces were able to identify that the incoming aircraft were Blue enemy aircraft. The Blue enemy attack could have been scripted, or Red forces could have been notified in advance.

¹⁴⁸ Fan Jianghuai [范江怀], Niu Hui [牛辉], and Li Dayong [李大勇], “PLA Exercise Encounters Embarrassment: Officers and Men See through Concealment and Camouflage of Our Side’s Airplanes” [“解放军演习遇尴尬：官兵见到己方飞机后隐蔽伪装”], *PLA Daily* [解放军报], March 3, 2015.

¹⁴⁹ “Beware of Battlefield ‘Own Goals’: A Certain Chengdu MR Division Explores and Implements Improvements to Battlefield IFF Capabilities” [“警惕战场‘乌龙球’—成都军区某师提高战场敌我识别能力的探索与实践”], *Kongjun Bao*, September 5, 2010, p. 2.

6. Conclusion

Overall, PLAAF SAM units are improving their capabilities, although progress is uneven and capabilities may vary significantly between similarly equipped units. Geographically, there is variation in intensity of SAM training across China's former seven MRs, and SAM units near the capital area and in the coastal regions appear to be most active. Temporally, PLAAF SAM units follow a yearly training cycle, and training peaks during the summer and early fall.

Content-wise, PLAAF SAM training largely corresponds to key themes from PLA training regulations such as the *Outline of Military Training and Evaluation*, Five-Year Plan–related training reform guidelines, and annual PLA training guidance from over the past decade. Training themes of 2013–2014 that appeared in those documents include mobility training, opposition force or confrontation training, live-fire and nighttime training, training in poor weather or difficult physical environments, and training in complex electromagnetic environments. PLAAF SAM training also appears to focus on countering the high-technology air assault threats envisioned by the 2005 *China Air Force Military Encyclopedia* as components of future training, specifically missiles, low-altitude targets, targets with low-radar cross-section, and countering electronic jamming.

SAM units are currently conducting more realistic and challenging combat training compared with the mid-2000s. They are engaged in more sophisticated confrontation training against aviation units, training without predetermined scripts and in unfamiliar territory, and training longer and under more difficult circumstances. SAM units also continue to emphasize and practice denial and deception tactics and focus significantly on countering low and extreme low-altitude targets. They are also engaging in substantial mobility and nighttime training, but face logistical hurdles that undercut their ability to rapidly move to operating locations and safety concerns that limit the difficulty of their training. There is limited joint and combined-arms training, despite the high priority the PLA places on acquiring the capability for integrated joint operations. SAM units do appear to be moving beyond simple altitude deconfliction toward sharing data and coordinating firepower with aviation units.

Looking forward, PLAAF SAMs are likely to continue to engage in more difficult and sophisticated training, including unscripted training against aviation opponents and complex operations at night. PLAAF SAMs are also likely to train more closely with PLAA air defense units as the two services work on their ability to operate jointly. Future research should explore developments in PLAAF capabilities in these areas.

Much is still unknown about PLAAF SAM training and operations, including how PLAAF SAMs train with radar, AAA, and ECM troops; how they coordinate with PLAA air defense forces as well as PLAN and Naval Aviation assets; and how PLAAF reserve forces train with the active force for air defense. Research on these topics would expand our understanding of SAM

training and operations. An additional valuable area for study could include an evaluation of the data and findings from KJB compilation presented here in light of classified sources.

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This report analyzes key trends and themes in China's People's Liberation Army Air Force (PLAAF) surface-to-air missile (SAM) unit training. After providing background information on China's air defense forces, the report introduces the basics of PLAAF SAM training, including training requirements, trends in recent training activities, and analysis of training themes.



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