



Testimony of Dr. Brendan S. Mulvaney before the U.S.-China Economic and Security Review Commission, Hearing on “China’s Military Reforms and Modernization: Implications for the United States”, Topic: (PLA) “*Air Force Modernization*”

Thursday, February 15, 2018

Vice Chairman Bartholomew, Senator Talent, and distinguished members of the Commission, thank you for your invitation to appear before you today to participate in the ongoing discussion about China’s military modernization. I am truly humbled to be part of this set of panels with such accomplished participants. My remarks today are my own opinions and do not represent the U.S. Air Force, Department of Defense, or any other governmental organization.

As evidenced by the number of participants, and the number of hearings this, and other commissions and committees, have held on this topic, it is of great and growing importance. And given the recent release of the National Security Strategy, Nuclear Posture Review, and the National Defense Strategy, the timing seems to be a good fit to help congress better understand the issues involved so they can help direct time and resources toward the most important lines of effort.

As we have already heard from the first panel about the overall modernization effort, and the establishment of the Strategic Support Force, and the Joint Logistics Support Force, I won’t dwell on them directly, but we will use that testimony to better understand and contextualize the modernization efforts of the PLA’s Aerospace Forces.

The China Aerospace Studies Institute (CASI) serves as the Department of Defense’s premier center for open-source native-language focused research on the PLA’s Aerospace forces and issues. I say ‘aerospace’ because we take a very broad view at CASI and look not just at the PLA Air Force (PLAAF), but also PLA Naval Aviation, Army aviation, rockets and missiles, space and satellites, and the civilian infrastructure, including cyber, that supports it. CASI’s mission is to advance understanding of the capabilities, development, operating concepts, strategy, doctrine, personnel, organization, and limitations. So it is an attempt to take a holistic view by looking not just at the advances in technology and weapons that make the PLA appear ten feet tall, but also the challenges they face, the way they approach warfighting and challenges, and the PLA cultural drivers that underpin the endeavor.

With that as a background, I’d like to quickly cover some of the most significant reforms and modernization efforts, and then I can respond to any specific questions in the Q&A session when we get to it. I’d also like to caveat that while the PLA uses three separate terms for what we usually refer to as “modernization” – modernization (weapons and equipment), regularization (organization and personnel), and revolutionization (anything to do with Party issues), I’ll use the U.S. version of ‘modernization’ for the discussion here, because I think that is really what the Commission is interested in.

To highlight what Xi Jinping has in mind, we need only look to his report from the 19th Party Congress,

“We will adapt to the trend of a new global military revolution and to national security needs; we will upgrade our military capabilities, and see that, by the year 2020, mechanization is basically achieved, IT application has come a long way, and strategic capabilities have seen a big improvement. In step with our country's modernization process, we will modernize our military across the board in terms of theory, organizational structure, service personnel, and weaponry. We will make it our mission to see that by 2035, the modernization of our national defense and our forces is basically completed; and that by the mid-21st century our people's armed forces have been fully transformed into world-class forces.”¹

1. How has China’s military reform effort (including the creation of the Strategic Support Force and Joint Logistics Force) affected air force modernization efforts?

PLA aerospace forces modernization has been underway in earnest for at least two decades. The latest round of PLA reforms has only served to codify and reinforce many of the changes that were already underway. Over the last two decades, we have seen a steady increase in the bureaucratic heft of the PLAAF, including the elevation of PLA Air Force General, and former PLA Air Force Commander, General Xu Qiliang as the senior vice-chairman of the Chinese Communist Party’s Central Military Commission (CMC) and previous inclusion of the PLAAF commander on the CMC (since re-organized to no longer include any service chiefs after the 19th Party Congress). However, the establishment of the Strategic Support Force seems to indicate that the PLAAF lost its bid to continue to have the leading role for space, and other advanced technologies like cyber. However, as we heard earlier, the establishment of the SSF clearly shows the importance the PLA leadership puts on the space and cyber domains, and that they intend to rapidly develop their aerospace capabilities, both within and outside of the PLA Air Force proper. Despite this bureaucratic setback as part of the current round of reorganization, the PLA aerospace forces, and Air Force in specific, continue to garner larger budgets and more attention from PRC national leadership.

Otherwise, PLA Air Force modernization efforts proceed apace. From continuing to acquire advanced technology and systems from Russia, and others, to attempts to indigenously develop new capabilities and technologies, the PLAAF is at the leading edge of modernization in several advanced fields, and they continue to close the capability gap with the United States faster than anticipated. This includes all branches of the PLA Air Force- Aircraft, SAMs, AAA, Radar, and Airborne forces. In fact, just last month the PLAAF just took delivery of S-400 systems, otherwise known as the SA-21 Growler, from the Russians. This is a definite improvement for the SAM branch of the PLAAF.¹

Progress in advanced aircraft, like the J-20 and the recent acquisition of Russian Su-35s, continues to grab headlines and attention in the Pentagon, and it certainly merits attention. But the PLAAF is also making progress in other areas, not quite as flashy but equally important for power projection and warfighting capabilities. Two such advances are 1) Air-launched Cruise Missiles (ALCMs) (likely CJ-20s on H-6Ks) that are dual (conventional and nuclear)-capable; 2) air-air refueling.

Tankers, acting as an “air-bridge”, provide mobility to get forces to the theater. Once in theater, tankers can act as force multipliers, making air assets more capable by enhancing their

¹ While it is still unclear exactly which version was delivered, the longest-range version can reach up to 400 km, which can threaten airspace over Taiwan.

range and persistence. USAF air refueling is one of the keys that makes the USAF an expeditionary air power for our nation. If an air force, like the PLAAF, can develop more than just a small niche tanker capability, it can have a strategic impact with other positive 2nd and 3rd order impacts.ⁱⁱ In 2017, an H-6K bomber was photographedⁱⁱⁱ with a refueling probe mounted on its nose.² When combined with the ability to mid-air refuel, the addition of ALCMs can make for a serious consideration for U.S. war planners, particularly as the U.S. Air Force's Global Strike Command believes China's CJ-20 long-range cruise missiles can deliver nuclear warheads as well as conventional payloads.^{iv} The combination of a more effective air refuelling bomber with ALCMs means that the U.S. must continue serious work on cruise missile defense (CMD) against ALCMs and develop strategies to eliminate the aircraft before they can launch these missiles. As Andrew Erickson and his colleagues put it, "Cruise missile threats, historically, have not earned the respect they genuinely deserve from the U.S., its allies, and partners, nor have these threats engendered much action on U.S. or its allies and partners' cruise missile defenses (CMD)".^v

Organizationally, as part of the modernizations and the recent reorganization the PLAAF has gone from 50 air divisions in the 1980s to largely a brigade structure today, as has PLA Naval Aviation.³ This allows the PLAAF to shed some of its institutional and organizational impediments, and work its way up the ladder toward being a more agile, flexible force, that at some point in the not too distant future may be capable of task-organized expeditionary activities. The shift to brigades is one of the most significant changes the PLA Air Force, and PLA in general, has undergone, and is focused directly on improving the PLA's war-fighting capability.

On the high-technology side, the PLA aerospace forces are increasingly more active. "We must keep it firm in our minds that technology is the core combat capability, encourage innovations in major technologies, and conduct innovations independently."^{vi} The PLA's continuing and increased interest in artificial intelligence (AI) is one example where the PRC's capabilities have rapidly closed the gap with the United States, and where the military-civil fusion doctrine is being fully implemented. We have seen evidence of increased use of AI at both the tactical level, with the use of AI to assist with swarm technologies and techniques, and at the strategic level for assisted decision making. This seems to have taken on an even greater interest with the advent and success of AlphaGO.⁴ There were reports of a "Blue team" (aka adversary for the PLA) using AI in a wargame and defeating the "Red team" (aka the PLA forces undergoing training). The PLA Air Force is also using AI as a training enhancer in both virtual and augmented training and simulation, to help attempt to make up for lack of real-world experience.⁵

² At the same time, the PLAAF recently began refueling the same fighter twice during a single sortie, which could also be extended to refueling bombers more than once. PLA Air Force News, 22 May 2017, p. 2.

³ Overall, the PLAAF has gone from 50 air divisions in the 1980s to about 20-25 today. As a result, the number of aircraft has been cut by at least one half and the organizational structure for fighter and attack units has been changed from a division and regiment structure to a brigade structure, while the primary 3 bomber and 3 transport divisions have not shifted to a brigade structure, at least yet; however the PLAAF has begun to create some transport and search and rescue (SAR) air brigades (one directly under PLAAF HQ and one in each of the 5 TCAFs).

⁴ AlphaGo is a computer program that plays the board game Go. It was developed by Alphabet Inc.'s Google DeepMind in London. In October 2015, AlphaGo became the first computer Go program to beat a human professional Go player without handicaps on a full-sized 19x19 board. At the 2017 Future of Go Summit, AlphaGo beat Ke Jie, the world No.1 ranked player at the time. Research Blog: AlphaGo: Mastering the ancient game of Go with Machine Learning". Google Research Blog. 27 January 2016.

⁵ CASI has forthcoming papers on PLA use of AI by CASI Associate Elsa Kania.

While the PLAAF has definitely been acquiring more high-tech weapons and equipment, it has also focused on actual-combat training with that equipment to be able to engage enemy forces if necessary over China's land and maritime areas. One example of this is the PLAAF's focus on the "four key training brands" competitions and exercises—Golden Helmet, Golden Dart, Blue Shield (Golden Shield), and Red Sword. CASI has a forthcoming report on this topic. The main take away is that the PLA continues to expand its use of actual-combat conditions, training and exercises, and is moving away from the traditionally scripted actions of the past. It was reported in the PLA Air Force News that in recent training events, "To make training more reflective of actual-combat real air battles, the rules of the Golden Helmet competition have expanded to include not only air battles between aircraft of the same model but also those between aircraft of different models; "one-on-one" airplane confrontation as well as formation-to-formation confrontation; and scorekeeping competition as well as "hit-to-bring-down fight." In 2011, the first competition incorporated "freestyle aerial dogfights" and eliminated the difference in altitude for horizontal maneuvers in aerial combat."

A recent article examined an Eastern Theater Command Air Force air brigade's efforts in improving training organization capabilities independently under the PLAAF's new "base-brigade"⁶ command structure. A staff officer from the brigade's Staff Department's Operations and Training Office, explained that the "base-brigade" command structure allowed the brigade level to organize training independently, in turn, it also demanded training organization personnel be proficient in not just executing specific duties, but also in formulating flight plans and organizing tactical subjects training. A navigation staff officer said that in the past his job was just to feed flight route data to commanders, but now his duties included assisting commanders in decision-making and providing tactical guidance to aircraft in training. He admitted to often experiencing panic due to his [lack of] abilities. Another deputy chief of staff pointed to the shift from a nanny style command concept to a more open approach.^{vii} This shows that the PLA has heard the repeated criticism that the U.S. was so kind to point out,⁷ and is taking steps to remedy the shortcomings.^{viii}

Taking the holistic approach, CASI is also examining the aerospace industrial base, including the military, 'commercial', and 'civilian' sectors. We believe that as China continues to try to develop its indigenous capabilities and its own commercial aircraft, like the C919 from the Commercial Aircraft Corporation of China, it will be the "military-civil fusion" that allows the PRC to overcome its remaining impediments to advanced systems, namely aero-engines (currently all of the J-10s that entered service in the last ten years are equipped with Russian engines^{ix}), advanced materials, and systems integration. As the PRC continues to pursue foreign partnerships (including some joint-ventures), and suppliers for its civil/commercial aerospace industry, it is important to continue to monitor the progress and expansion of this part of the PRC aerospace 'ecosphere', because it carries implications for both military and civil applications.

Finally, lest we think everything runs smoothly for the PLA, there have been notable issues in morale, training, and family issues, related to the massive reorganization. The government in Beijing has stated that they believe the PRC is in a "period of strategic opportunity", and thus has assumed the risk associated with the reorganization and its attendant decline in morale and readiness, in order to complete the changes before the 'period' ends, and meet their self-imposed timelines of 2035 and transforming the PLA into a "world class" force by 2049. CASI has a

⁶ PLA Air Force News 5 July 2017, The new base-brigade system (基地-旅体制) integrates battle, training, management and support (战训管保), and is essential to the development of system-of-systems operational capabilities (体系作战能力).

⁷ For example: regarding the limitations of centralized command and control / scripted training, etc.

forthcoming paper looking at some of the challenges and detrimental effects that the reorganization is causing.

2. What kinds of missions and operations is the “strategic air force” concept designed for, and what does this mean for U.S. defense planners, and U.S. allies and partners in the region?

In 2004, the Party’s Central Military Commission (CMC) approved the PLA Air Force’s first-ever service-specific strategic concept.⁸ This concept clearly suggested a much broader mission than in the past, with a greater emphasis on offense. The Air Force was to, ‘Integrate air and space; be simultaneously prepared for offensive and defensive operations’.

Then, the 2008 PRC defense white paper went on to describe the PLAAF as “a strategic service of the PLA.....To meet the requirements of informationized warfare, the Air Force is working to accelerate its transition from territorial air defense to both offensive and defensive operations, and increase its capabilities for carrying out reconnaissance and early warning, air strikes, air and missile defense, and strategic projection, in an effort to build itself into a modernized strategic air force.”^x So I think that pretty clearly spelled out, a decade ago, where the PLA wanted their Air Force to go.

I’m going to borrow from Mike Chase for a minute and use a quote he found that says, from the PLA, “When we talk about strategic air force and strengthening the air force it includes 3 things: bright eyes, strong fists, and long arms.”^{xi} This can be seen as roughly analogous to the U.S. Air Force’s Global Vigilance (bright eyes), Global reach (long arms), and Global power (strong fists). So, it is clear that the PLA has their sights set on becoming a strategic air force, and their model/ pacing threat is the U.S. Air Force. While their culture and organization will prevent them from actually duplicating USAF agility and adaptability, the PLA has clearly learned some of the lessons we have been telling people they need to learn.

The 2 June 2017 edition of the PLA Air Force News was a special edition reporting on the “2017 Air Force Concentrated Training for Principal Officers at the Division, Brigade and Regiment levels” that took place from 20 to 26 May 2017. PLAAF Commander Ma Xiaotian and PLAAF Political Commissar Yu Zhongfu both delivered lectures in person. Participants reached two important conclusions. First, the PLAAF was historically close to the threshold of becoming a strategic air force and to the frontier of the air and space domain. Second, [the PLAAF should] speed up the process to become a world-class, strategic air force. According to this article, a world-class force entailed the following elements: world-class weapons and equipment, organizational structure, operational systems, talented professionals, training performance, and military theoretical (foundations). According to Air Force senior leaders, a world-class strategic air force must have strong strategic capabilities, must integrate air and space and have both offensive and defensive capabilities, must integrate operational system-of-systems, and must have very strong “soft powers”. In terms of operational capabilities, the core demand is to be able to prevail in combats (to win fights), i.e., to possess strong operational capabilities in air and in space, effectively safeguard national sovereignty, security, and developmental interests.

The implications for U.S. interests, allies, and partners are fairly significant. No longer can the U.S. and its allies plan for and count on being able to achieve air superiority, much less air supremacy as rapidly as we do now.^{xii} While I will emphasize that the PLA has yet to

⁸ Almost 20 years after the CMC authorized the PLA Navy’s first strategy known as “off shore defense”

achieve the capability to challenge American and allied forces in the air, this is clearly a goal they are working hard to achieve, toward which they are making great strides. For planners, the fight is not tonight, but some point in the future; and the inability to immediately establish and maintain air superiority (as we have been able to do in every case for the last half century) needs to be a major consideration, and topic of frequent discussion with our allies and partners, as well as within our own planning staffs.

Furthermore, the fact that the PLA isn't ready to challenge the U.S. in combat, does not mean that the advances the PLA aerospace forces are making don't already have consequences for the U.S., its allies and partners. CASI sponsored two studies through Headquarters U.S. Air Force (HAF A5) conducted by Rand's Project Air Force which directly get at the heart of this matter. The first focused on how increased PLA air operations in the East China Sea are affecting U.S. interests, allies, and partners- primarily Japan, but with implications for Taiwan, the Philippines, Vietnam, and others; and second looked at how the PRC is beginning to use bombers for strategic messaging and deterrence. This is having a real and dramatic affect today, and we would be happy to share those studies once they are complete and ready for release at the time of our annual conference in May.

3. What are the PLAAF force building and acquisition priorities and how do they align with the PLAAFs "strategic air force" concept?

On the topic of force building, the PLA Air Force is well ahead of the other services. In a November 2017 article in the PLA Air Force News it was announced that for the first time, more than half (53.6%) of incoming enlisted members had some college education (either current students or graduates)^{xiii}, this compares to approximately 35% of the overall PLA enlisted force having college experience. This directly goes to the heart of their drive to "win informationized local wars."^{xiv} Additionally, although the PLA is undergoing a 300,000-man downsizing, of which one-half are officers, the PLAAF actually increased from 378,000 in 2012 to 420,000 in 2017.^{xv}

As for the hardware, today's PLA Air Force is a mix of export model Russian fourth generation fighters, "indigenously" designed fighters (which are largely a result of aggressive reverse-engineering), larger support aircraft, and a significant and growing bomber fleet.⁹ In November 2017, PLAAF Commander Ding Laihang, while visiting the newly-reorganized Air Force Research Academy in Beijing, noted that " thanks to its high-tech nature, the (development of the) Air Force needs to strive to be ahead of other services."^{xvi} During the same visit, Ding also emphasized that the development of the PLAAF should be "led by [building] a Strategic Air Force."^{xvii}

A quick rundown shows that the J-10, manufactured by the Chengdu Aircraft Industry Group, along with all its variants, gives the PLA a rough-equivalent to western 4th generation fighters, think along the lines of the F-16.

The J-11A is the Russian Su-27 *Flanker* produced by China under license.

Just last month, January 2018, the PLA Air Force confirmed that they had taken delivery of a second batch of ten Sukhoi Su-35 fighters from Russia. These are essentially improved derivatives of the Su-27. The Su-35s have already flown over the South China Sea.^{xviii}

⁹ "Information available to Jane's from Asian government sources largely confirms the broad trends of the Pentagon report, though estimated numbers are at variance. For 2014, Asian government sources note that China has 946 modern combat aircraft, more than 300 above the US estimate for 2013; the same sources report that by 2020 this number could grow to 1,562." <https://janes.ihs.com/Janes/Display/1319011>

The J-20 represents China's first indigenously developed stealth aircraft. In November 2016, China openly demonstrated the J-20 stealth fighter in public for the first time by performing a 60-second flyby at the Zhuhai air show.

The Y-20, is a four-engine heavy transport, based at Yanliang airbase near Xi'an. It made its first public flight on January 26, 2013.

The PLA's airborne early warning and control aircraft is the KJ-200, which is based on the Russian Yak-8, and the KJ-2000, which is based on the Russian Il-76. It also has a new KJ-500 airborne early warning and control aircraft.

The H-6U is the PLA's "indigenous" tanker, but appears to have significant limitations due to the amount of transferable fuel it can carry.¹⁰ In addition, only a few aircraft variants can be air refueled.

The PLA Navy is increasingly using the H-6K fleet for long range flights, pushing boundaries, and gaining intelligence about U.S. assets, allies, and partners in the region¹¹. And of course, carrier-based aviation assets like the J-15 fighters, Z-18F anti-submarine warfare (ASW) helicopters, Z-18J airborne early warning helicopters, and Z-9C rescue helicopters, will continue to train and exercise more with the PLA Air Force, and likely the PLA Rocket Force, in the future, as the PLA continues to build out its vision for "Joint" Theater Commands. Our 'big brother' organization, the China Maritime Studies Institute (CMSI) at the Naval War college continues to produce noteworthy research on these topics as well.

The bottom line is that the PLA has deliberately and methodically transformed its air force from a dated, bloated territorial defense-based force, to a modern force with strategic ambitions. We should expect nothing different in the future decades. The PLA will continue to focus on gaining and improving their access to stealth technology, and stealth defeating technologies lest we forget the defensive aspects of PLA modernization; advanced and more secure means of command and control, be it through quantum communications breakthroughs, or more traditional means; hypersonic delivery vehicles, arguably a field in which the PRC is a, if not 'the', leading nation; integration of artificial intelligence, better use of 'big data' and advanced analytics; all of which will be supported through a more robust military-civil fusion network of academic and research facilities which can draw on the length and breadth of the PRC's aerospace experts, not just those in the PLA.

We should expect to see the PLA undertake more ambitious and longer-range flights, and likely deployments, probably under the name of international cooperation or exchanges initially, and increasingly 'joint' training, exercises, and operations, between their Air Force, their naval aviation, and other PLA forces. CASI has a research report forthcoming on this very topic.

4. How does the PLAAF determine its service-specific weapons acquisition and weapons development priorities?

5. How has the military reform effort and the dismantling of the General Armament Department affected the military modernization at the service level, particularly for the PLAAF?

¹⁰ It holds only 37,000 pounds of transferable fuel (PLAAF analysis calls for a platform capable of holding 80,000–100,000 pounds). Buy, Build, or Steal: China's Quest for Advanced Military Aviation Technologies. Phillip C. Saunders and Joshua K. Wiseman, China Strategic Perspectives 4, INSS, National Defense University.

¹¹ See CASI's forthcoming studies sponsored via HAF A-5 by Rand's Project Air Force for more information.

Weapons acquisition serves as a means to achieve an overarching national strategic objective and it needs to be understood as part of the Great Chinese national Rejuvenation scheme, as, more specifically, part of President Xi Jinping's building a strong nation with a strong army strategy. Given the nature of the PLA as a party-army, its weapons acquisition is of course about gaining military advantages, but it is also about the national pride and advancing the Comprehensive National Power (综合国力) to compete with the best, the United States.

The GAD (General Armament Department) was never in charge of the PLAAF's R&D process. It was primarily the Army's Equipment/Armament department. Unlike the GSD, GPD, and GLD, the GAD never even once had a deputy from any of the other services. It was responsible for overseeing, but not managing, the equipment R&D for the Navy, Air Force, and Second Artillery. The new Equipment Development Department is much smaller and appears to merely oversee all of the service (PLAA, PLAN, PLAAF, and PLARF) equipment development departments, but not manage them. The PLAAF Equipment Department, in conjunction with the Air Force Equipment Research Academy, which was created in 2004, has responsibility for Air Force weapons and equipment development and maintenance. And since the 1998 reforms to the RDA¹² system, which gave military considerations more weight in the RDA process,^{xix} strategy and doctrine appear to be driving PLAAF acquisitions rather than technologic advances pushing from the aviation industry. As an example of this shift, the PLAAF Commander has publicly confirmed development of a new bomber, likely to be known as the H-20, for long-range strike missions.^{xx} This indicates that the aerospace forces are focusing on missions and capabilities to drive technology and innovation.

The PRC's civilian leadership has clearly put great emphasis on indigenous innovation, which, when combined with military-civil fusion, is intended to yield greater technological advances, which will more quickly be adapted and integrated by the PLA. Similarly, in 2000, the PLAAF established a program named the "Air Force Academician". Through this program, the Air Force invited academicians from China's two most prestigious science and engineering institutions, the so-called "two academies"- the Chinese Academy of Sciences and the Chinese Academy of Engineering to become Air Force consultants, overseeing the development of China's new combat systems and the R&D process of indigenous design and development of weapons and equipment. It has been acknowledged by various PLAAF leaders that over the past 17 years, a total of 156 academicians worked as advisors for the Air Force and they provided important intellectual support for the strategic transition of the PLAAF.¹³ On 14 September 2017, the PLAAF Commander Ding Laihang and Political Commissar Yu Zhongfu both participated an annual meeting with these Air Force Academicians.¹⁴

Of particular note, based on recent CASI research, it appears that the PLAAF's Equipment Research Academy,¹⁵ may have been reformed and possibly upgraded to be the Air Force Research Academy. This potential upgrading represents increased bureaucratic

¹² Research, Development, and Acquisition

¹³ Liu Shuang (刘爽), Liu Pengyue (刘鹏越), Zhu Zhanghu (朱章虎), "The 6th Meeting with the Academicians on Air Force Construction and Development" *Air Force News*, 15 September 2017.

¹⁴ http://www.thepaper.cn/newsDetail_forward_1794897

¹⁵ The research academy is responsible for consolidating the strengths of the PLAAF's scientific research, implementing S&T strategy for a strong military, and speeding up the informatization of the PLAAF's equipment and weapons. The academy was created in 2004

importance and power, and could indicate a greater role in the development of new military systems.

One thing to keep in mind is that, although the PLAAF has a 4-5 step process for acquisition,¹⁶ the different aircraft factories each have their own research institute, which are always coming up with new ideas independently. As a result, it is not necessarily the Equipment Research Academy who comes up with the idea for a new weapon system or piece of equipment. It is then the responsibility of the PLAAF's military representatives at that research institute or their regional military representatives to coordinate this with the PLAAF. Interestingly, it appears that PLAAF military representatives continue to spend most of their career in the same office rather than rotating to new assignments.^{xxi}

6. What recommendations do you have for Congress concerning the topic of your testimony?

a. Maintain vigilance. Continued hearings on this and related topics, keep up interest in Congress, in think tanks, in academia, in policy circles, and in the national security establishment.

b. Continue to ask the Department of Defense to dedicate and prioritize time and resources to both the classified and unclassified study of the PLA and the PRC more broadly. CMSI, CASI,

¹⁶ The PLAAF Headquarters' Equipment Department is responsible for overseeing all of the PLAAF's weapon system and equipment development. For more sophisticated systems, the development process discussed below generally lasts for about ten years and is gradually taking longer for each new generation of equipment. For example, the China Air Force Encyclopedia states that the development time lasted 3-5 years for first-generation, 5-7 years for second-generation, and 7-12 years for third-generation combat aircraft, and currently takes about 20 years for fourth-generation combat aircraft. The development cycle consists of the following four primary phases: Demonstration (论证); Proposal (方案); Engineering Development (工程研制); Design Finalization (设计定型) and Production Finalization (生产定型).

Once preparatory research is completed, the first phase of Chinese RDA, called "demonstration," begins. This phase is sometimes translated as the theoretical evaluation, verification, or weapon system concept research phase. In this phase, the idea for a system is examined to ensure the feasibility of translating the technology into a system that the military can use.

In the second phase, called "proposal," the main performance characteristics of the conceptual system are defined and then tested to see whether they will be acceptable to the military. This phase may also be referred to as the project planning, design, or prototype phase. During this phase, the best technologies from the demonstration phase are selected to be developed.

PLAAF research institutes and military representatives at the production facility conduct a joint evaluation along with the contractor and a prototype/mockup (样机) is developed. This phase can now involve competitive development of prototypes by different factories, with the PLAAF choosing which proposal to accept.

During the third phase, called "engineering development," the factory and associated research institutes responsible for full-scale development of the system design, produce and test it. This phase can often be the longest, taking several years.

Designing, producing, and testing the aircraft. This phase can be the longest, and timelines have lengthened as China develops more ambitious aircraft. The Air Force Equipment Research Academy, its associated research institutes, and Air Force military representatives are all involved in the engineering development phase.

The fourth and final phase combines design finalization and production finalization. The design finalization component involves a comprehensive review and inspection of the new weapon system or equipment throughout the process, including systematic testing of each component of the prototype or prototypes. During the production finalization component, the new system is produced for delivery to the operational force. Once the new system or equipment enters the operational force, it can still take a long time, possibly years, before the system and its personnel are considered combat capable. Ken Allen, and People's Liberation Army Air Force 2010, National Air and Space Intelligence Center: Wright-Patterson Air Force Base, Ohio, 1 August 2010.

and other military research organizations provide the U.S. government the cost-effective ability to draw from in-house experts, and to conduct dedicated research on these relevant topics, which can help Congress in its decision-making process as well.

c. Consider requesting or commissioning dedicated research reports focused on PLA modernization (in U.S. terms) efforts across the spectrum of capabilities, with continued emphasis on the implications for U.S. planners and American research, development, and acquisition efforts.

ⁱ Xi Jinping, “Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for a New Era,” Delivered at the 19th National Congress of the Communist Party of China, October 18, 2017.

http://www.chinadaily.com.cn/china/19thcpcnationalcongress/2017-11/04/content_34115212.htm, accessed on February 6, 2018.

ⁱⁱ Credit to Dr. Carl Rehberg, currently at CSBA, for his work in this area. For more details on China related to nuclear issues, please see the forthcoming CSBA publication: *Sustaining the Nuclear Deterrent: The LRSO and GBSD*, by Mark Gunzinger, Carl Rehberg and Gillian Evans. That publication is expected to be available late February or early March 2018.

ⁱⁱⁱ Richard D. Fischer, Jr., “Chinese Xian H-6K With Refueling Probe Suggests New Missions,” *Jane’s Defence Weekly*, August 18, 2017, available at <http://www.janes.com/article/73182/chinese-xian-h-6k-with-refuelling-probe-suggests-new-missions>.

^{iv} “Strategic Weapon Systems,” *IHS Jane’s Sentinel Security Assessment - China and Northeast Asia*, April 7, 2017, available at <https://janes.ihs.com/Janes/Display/cnaa015-cna>.

^v Dennis M. Gormley Andrew S. Erickson, and Jingdong Yuan, *A Low Visibility Force Multiplier: Assessing China’s Cruise Missile Ambitions* (Washington DC: NDU Press, 2014).

^{vi} Xi Jinping, “Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for a New Era,” Delivered at the 19th National Congress of the Communist Party of China, October 18, 2017.

http://www.chinadaily.com.cn/china/19thcpcnationalcongress/2017-11/04/content_34115212.htm, accessed on February 6, 2018.

^{vii} PLA Air Force News, 24 July 2017

^{viii} PLA Air Force News

^{ix} Yefim Gordon and Dmitriy Komissarov, *Chinese Air Power: Current Organisation and Aircraft of All Chinese Air Forces* (Surrey: Ian Allan Publishing Ltd., 2010)

^x Information Office of the State Council, People’s Republic of China, *China’s National Defense in 2008*, Beijing, China, Jan. 2009, http://english.gov.cn/official/2009-01/20/content_1210227.htm

^{xi} Du Wenlong, CCTV interview, July 2016: http://kj.81.cn/content/2016-07/22/content_7169667.htm

^{xii} The PLAAF never uses these terms. They command of the air (制空权), which means control of a certain air space for a certain period of time, not 24-7. Air superiority — That degree of dominance in the air battle by one force that permits the conduct of its operations at a given time and place without prohibitive interference from air and missile threats. (JP 3-01). Air supremacy — That degree of air superiority wherein the opposing force is incapable of effective interference within the operational area using air and missile threats. (JP 3-01)

^{xiii} PLA Air Force News, 24 Nov 2017

^{xiv} 2015 Defense White Paper, The State Council Information Office of the People’s Republic of China, http://www.chinadaily.com.cn/china/2015-05/26/content_20820628.htm

^{xv} 2012 PRC Defense White Paper. “China’s new air force chief lays out long-range mission” *South China Morning Post*, 23 August 2017, <http://www.scmp.com/news/china/diplomacy-defence/article/2108010/china-appoint-new-air-force-commander-sources-say>.

^{xvi} Qiao Songbai, Xu Tongxuan, “Commander Ding Laihang visits Air Force organizations stationed in Beijing,” *Air Force News*, 14 November 2017, p.1.

^{xvii} *Ibid*,

^{xviii} “China sends advanced jet fighters to South China Sea for joint combat missions,” 7 February 2018, http://eng.mod.gov.cn/news/2018-02/07/content_4804400.htm.

^{xix} Philip Saunders, Joshua Wiseman, *The People’s Liberation Army Air Force and the Chinese Aviation Industry*, UC San Diego, SITC Research Briefs, 2013(Research Brief 2013-12)

^{xx} An article published by the China Military Online website in December 2016 provided further insights into the requirements for China's new strategic bomber. Remarks made in the media report by Rear Admiral Yin Zhuo, director of the PLAN's Expert Consultation Committee, reiterated that China is developing a new long-range strategic bomber, referred to in the article as the H-20. Although no concrete details have been given, the public acknowledgement by the head of the PLAAF and the subsequent discussion in official media channels suggest that the project has been under way for some time. <https://janes.ihs.com/Janes/Display/1319011>

^{xxi} Kevin Pollpeter and Ken Allen, “PLA Air Force Organizational Reforms: 2000-2012.”, 2015