TESTIMONY

The Development of China's Air Force Capabilities

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CT-346

May 2010

Testimony presented before the U.S.-China Economic and Security Review Commission on May 20, 2010

Published 2010 by the RAND Corporation
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Mr. Chairman: Thank you for inviting me to participate in today's hearing on this important topic. China's air forces have made substantial strides over the past decade and are well on their way to becoming fully modern. Coupled with the geographic advantage China would enjoy in the most likely military conflict between China and the United States – a war over Taiwan – the capabilities of China's air forces have the potential to present a significant obstacle to U.S. success in such a conflict. Understanding these capabilities, therefore, is critical to understanding the nature of the military challenge China is presenting to the United States.

Before I launch into the substance of my testimony, let me explain what I will talk about and what I will not. As is true in many country's militaries, China's air forces are distributed across more than one service. The U.S. Army, for example, likes to say that it operates more aircraft than the U.S. Air Force (USAF), a reference to its helicopter force. Likewise, the People's Liberation Army's (PLA's) ground forces also operate a substantial helicopter force, and the PLA Navy (PLAN) operates both fixed wing aircraft and helicopters. I will not discuss the PLA Army or PLAN helicopter forces, but I will discuss the PLAN's fixed-wing aviation forces.

China's air force, the People's Liberation Army Air Force (PLAAF), operates not only fixed wing aircraft and helicopters; its combat forces also include long-range surface-to-air missiles (SAMs), large-caliber antiaircraft artillery, and paratroops. When discussing China's "air forces," therefore, I will include not only the fixed-wing aviation forces of the PLAN and PLAAF, but also the PLAAF's land-based air defense forces and airborne forces.

As an aside, I should note that, although the term is commonly used, there is not actually an organization in China called the People's Liberation Army Navy Air Force (PLANAF). The PLAN has aviation forces, but they are not collected into a single, unified organization. Rather, each of

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China's three fleets (the North Sea Fleet, East Sea Fleet, and South Sea Fleet) has its own aviation organization underneath it. (Interestingly, this is similar to the U.S. Navy, which also does not collect its aviation forces into a single organization separate from the rest of the Navy, but rather divides its aviation forces into two entities: Naval Air Forces U.S. Pacific Fleet and Naval Air Forces U.S. Atlantic Fleet.)

China's air forces have improved significantly over the past 10 years. In 2000, of the estimated 3,200 fighter aircraft operated by the PLAAF and PLAN, for example, all but approximately 75 "fourth-generation" Su-27s ("Flankers") imported from Russia and 20 domestically designed and built third-generation JH-7s, were based on the 1950s-era second-generation MiG-19 and MiG-21. China's fighters, moreover, were dependent on ground-based radar or their largely outdated on-board sensors to locate and identify enemy aircraft, as China had only one operational airborne early warning (AEW) aircraft. In addition, except for the Flankers, they were limited to within-visual-range engagements, as China's domestically-produced aircraft were not equipped with beyond-visual-range (BVR) missiles. China's electronic warfare capabilities were minimal as well. By comparison, the U.S. air forces of 2000 were equipped entirely with fourth-generation fighters, all of which carried BVR missiles, and operated numerous airborne early warning and control (AWE&C) and electronic warfare (EW) aircraft. In an air-to-air engagement between Chinese and U.S. air forces in that year, the United States would likely have enjoyed an advantage at least as great as it did in the 1991 Gulf War against Iraq, when 33 Iraqi aircraft were shot down by U.S. air forces while only one U.S. aircraft was lost in air-to-air combat.

Except for a few bombers equipped with antiship cruise missiles or torpedoes, China's strike aircraft in 2000 carried only unguided gravity bombs and rockets, and certainly none of them had the low-observable capabilities of the U.S. F-117 and B-2. Thus, the ability of China's air force to conduct effective attacks against surface targets, or even survive the attempt against a modern adversary, was highly questionable.

The training of China's air forces was considered poor. Pilots of all aircraft types were believed to average fewer than 100 hours of flight training a year, and exercises highly scripted, with pre-determined outcomes. Virtually all officers in China's air forces were either graduates of PLA-run military academies, the quality of whose education was questionable, or had been directly promoted from the enlisted ranks without receiving a higher education. Finally, the PLAAF and PLAN were in the process of absorbing an entirely new set of doctrinal guidelines that had just been issued in 1999, in many cases replacing doctrine that had not changed for twenty years.

Today the picture is very different. China has reduced the overall size of its air forces, with the PLAAF alone cutting approximately 100,000 personnel – roughly a quarter of the force – and halving the size of its fighter force. A top-heavy organizational structure has also been streamlined, with the PLAAF eliminating one entire organizational level – the corps-level – and all of its associated general officer billets. The remaining forces are considerably more capable than those in 2000. The number of second-generation fighters in China's inventory has been reduced by two-thirds, and the number of fourth-generation fighters has more than quadrupled.

There have been improvements in other dimensions as well. Many of China's fighters are now capable of carrying BVR missiles, China operates at least a dozen AEW&C aircraft, many strike aircraft are now equipped with precision-guided munitions (PGMs), and China's EW capabilities have improved substantially too. Many Chinese fighter pilots are now believed to receive roughly the same number of training hours as their U.S. counterparts, and the quality and realism of training has also improved. Roughly half of all new officers in China's air forces are now graduates of China's increasingly rigorous civilian universities. Finally, China has had an additional ten years to absorb the modern doctrinal guidelines issued in 1999.

Nonetheless, China's air forces are still only partly modernized. Two-thirds of the roughly 1,600 fighter aircraft operated by China's air forces, for example, are still based on the MiG-19 and MiG-21, and less than a quarter of China's fighter force consists of fourth-generation aircraft. Many of China's aircraft are still not capable of carrying BVR missiles or PGMs, and none are stealthy. In addition, China lacks long-range heavy bombers and has only limited aerial refueling and strategic airlift capabilities. Finally, while the quality of training in China's air forces has improved markedly in the last ten years, it still falls well short of U.S. standards.

The fundamental missions of the PLAAF and PLAN aviation have not changed in recent years. The primary missions of the PLAAF are to seize and hold air superiority, and thereby defend China against enemy airstrikes and conduct airstrikes on enemy forces. The PLAAF also has missions of conducting airborne operations (the PLAAF controls not only the transport aircraft for China's airborne forces but also the paratroops that they carry), performing surveillance and reconnaissance and providing early warning of enemy attack, conducting airlift operations, providing disaster relief, and performing search and rescue operations. The PLAAF does not appear to have a nuclear strike mission. The missions of fixed wing PLAN aviation are to conduct naval strike operations and defend naval bases against enemy air attack.

Although the fundamental missions of the PLAAF and PLAN aviation have not changed in recent years, emphases among and within some of the missions has. In 2000, for example, the PLAAF

was largely a defensive force. Its bomber force was small, most of its fighter aircraft were capable only of air-to-air combat, and it had no precision ground-attack aircraft. Its primary mission, therefore, was to defend China against enemy air attack. Attacks on enemy ground forces and targets were a secondary priority. Today, the PLAAF's bomber force is expanded, even as the size of the fighter force has shrunk; a greater proportion of fighter aircraft are capable of ground-attack missions; and the PLAAF possesses a wide range of PGMs. This has both improved the PLAAF's capability to achieve air superiority, by enabling it to more effectively attack enemy air forces on the ground, and significantly increased its ability to support ground and naval operations through air-to-surface operations. Thus, the missions of defending China from enemy airstrikes and conducting airstrikes on enemy forces are now accorded equal importance. The doctrinal shift to equal emphasis on offensive and defensive operations probably actually occurred in 1999, with the issuance of the PLAAF's new doctrinal guidelines, but was not officially acknowledged in the PLA's overall strategy until 2004, when the PLAAF's component of the PLA's National Military Strategic Guidelines was identified as including "preparing for both the offense and the defense" (攻防兼备). This, in turn, was alluded to in China's 2004 national defense white paper, the English version of which stated that "the Air Force has gradually shifted from one of territorial air defense to one of both offensive and defensive operations." The capabilities for conducting offensive operations are still developing; however, as the PLAAF's inventory of PGMs is probably still small, it does not have stealth aircraft, and does not appear to practice true close air support operations.

The doctrinal shift to the offense, moreover, does not mean that the PLAAF's air defense capabilities have been neglected. Indeed, an argument can be made that the greatest improvements in PLAAF capabilities over the last ten years have occurred in its SAM forces. In 2000, other than four battalions of Russian-made S-300 (SA-10B) systems, the bulk of the PLAAF's SAMs consisted of modernized versions of the 1950s-era SA-2, supplemented by a domestically-produced version of the short-range French Crotale system. Today, the total number of missiles in the PLAAF's SAM inventory has more than doubled, and the majority of them are now modern ("double-digit") systems, the four battalions of S-300s (100 km range) having been supplemented by at least sixteen battalions of the more-capable S-300PMU1 (150 km range) and comparable domestically-produced HQ-9, along with at least eight battalions of the even-more-capable S-300PMU2 (200 km range). This improvement in SAM capability, moreover, has been accompanied by improvements in the coverage and integration of China's national air defense network, with Xinhua News Agency announcing in 2007 that an "air intelligence radar network" covering the entire country had been completed.

Another shift in PLAAF mission emphasis in recent years has been that accorded to disaster relief. Disaster relief has always been a mission of China's armed forces, with China's first national defense white paper, issued in 1998, listing "participating in emergency rescues and disaster relief work" as one of the principal tasks of the PLA and touting the PLA's contributions in this area over the previous two decades. Since Chinese president and Central Military Commission chairman Hu Jintao's pronouncement of "new historical missions" for the PLA in 2004, however, and particularly since the Sichuan earthquake of 2008, disaster relief has been accorded a new priority. The intention seems to be that the PLA will not simply perform this task on an ad hoc basis when directed to do so by the national leadership, but will actually organize, train, and equip for performing it. That said, the extent to which it actually is organizing, training, and equipping for this mission is not clear. The PLAAF's primary contribution to disaster relief, for example, would probably come in the form of using its tactical airlift capabilities to deliver personnel and supplies to small airports near the site of the disaster and to evacuate the sick and injured. The PLAAF could also provide visual and imagery reconnaissance to survey damage, locate survivors, etc. The PLAAF's inventory of tactical airlift aircraft (e.g., the Y-7 and Y-8 turboprops), medium-lift helicopters, and reconnaissance aircraft, however, appears to have actually shrunk since 2004. It is possible that the eliminated airframes were old and nonfunctional anyways, and to some degree the roles of manned reconnaissance aircraft may be in the process of being replaced by unmanned aerial vehicles (UAVs), so the reduction in inventory may not represent a reduction in capability. Nonetheless, there is no clear evidence to support a conclusion that the PLAAF is acquiring aircraft for the specific purpose of supporting disaster relief operations. Likewise, I do not know if the PLAAF has been conducting significant training devoted to disaster relief operations, although it is possible, or if any dedicated disaster relief units have been created, though I doubt it.

The relative importance of the other PLAAF missions – conducting airborne operations, performing (wartime) surveillance and reconnaissance and providing early warning of enemy attack, conducting airlift operations, and performing search and rescue operations – does not appear to have significantly changed, although in some cases capabilities have. As noted above, the size of the PLAAF's tactical airlift inventory has actually shrunk since 2004, (this is even more true when it is compared to 2000), and the size of its strategic airlift inventory (e.g., Il-76s) has increased only slightly from quite modest levels. Thus, the priority accorded to airlift does not appear to have increased and may actually have decreased somewhat.

Also as noted above, the size of the PLAAF's inventory of manned reconnaissance aircraft has shrunk as well since 2000. This does not necessarily mean that the importance of the mission of performing (wartime) surveillance and reconnaissance and providing early warning of enemy

attack has been reduced, however. The sensors on the PLAAF's remaining reconnaissance aircraft may have been upgraded, many of their roles are probably being played by UAVs, and China's reconnaissance satellites can now perform many of the functions formerly performed by aircraft. Moreover, China's ability to conduct surveillance (of airspace) and provide early warning of airborne attack has actually increased, with the acquisition of airborne early warning aircraft and completion of an air intelligence radar network covering the entire country. Thus, although there is no evidence that the PLAAF's mission of performing surveillance and reconnaissance and providing early warning of enemy attack has increased in priority relative to its other missions, its capability to conduct this mission has on the whole improved, just as its capability to perform its other missions has improved.

Similarly, there is no evidence that the PLAAF's mission of conducting search and rescue operations has increased in priority, but its capability to do so appears to have improved somewhat over the past decade, with the acquisition of dedicated search-and-rescue helicopters (based on the Aerospatiale Super Frelon design) and, presumably, associated training and procedures.

The importance accorded to the PLAAF's one other current mission – conducting airborne operations – is unclear. There is some evidence that suggests that its priority has increased somewhat recent years. The overall size of the airborne forces has remained the same and, as noted, the PLAAF's airlift capacity has not significantly expanded over the past decade. China's defense industries, however, have been developing a range of air-transportable and air-droppable vehicles, suggesting a desire to increase the ground combat capabilities of the airborne forces. The potential utility of increased airborne capabilities in an invasion of Taiwan is clear, as the greatest challenge in such an operation would be transporting ground forces across the water that separates Taiwan from China. However, there does not appear to be a large-scale push to develop an improved airborne capability. This may reflect skepticism about the military viability and effectiveness of airborne operations against Taiwan, or the low priority accorded to airborne operations in a PLAAF for which aviation is the dominant branch.

A final PLAAF mission area that needs to be addressed is space operations. The PLAAF's component of the PLA's 2004 National Military Strategic Guidelines reportedly included not just "preparing for both the offense and the defense" but also "air and space integrated" (空天一体).

Unlike references to preparing for both the offense and the defense, however, this element has never been alluded to in any of China's official national defense white papers. In fact, a struggle is currently underway within the PLA right now over the control of space operations. Today, China's space assets are controlled by the headquarters-level General Staff and General Armaments

Departments. Both the PLAAF and the Second Artillery Force, however, are contending that they should be in control of space operations, with the PLAAF's argument based in part on the assertion that air and space are a single integrated medium. The ultimate outcome of this bureaucratic contest is difficult to predict, but, if the PLAAF is successful, then conducting space operations will become one of its missions.

China's 2008 national defense white paper suggests that the PLAAF may now have an additional mission: "strategic projection." The white paper states that the PLAAF has "certain capabilities to execute long-range precision strikes and *strategic projection operations*" and that it is working to increase its capabilities for carrying out a number of operations including "strategic projection." I was a bit taken aback when I first saw this language, as it sounds close to "strategic power projection," something I didn't think the Chinese government would admit to in a public document, so I looked at the Chinese version of the white paper. It turns out that a better translation of the term would be "strategic force delivery" (the Chinese word translated as "projection" is 投送), which, for an air force, means strategic airlift. So the "strategic projection" capabilities that the PLAAF claims to be working to increase are just its strategic airlift capabilities. And, as noted above, the PLAAFs progress in this area over the past decade has been modest.

As with the PLAAF, the missions of PLAN aviation have not fundamentally changed in recent years, but its capabilities to conduct them have improved. The primary mission for PLA aviation is naval strike operations. In 2000, however, the PLAN's most effective strike aviation assets were 20 JH-7 fighter-bombers armed with the Exocet-like C-801K anti-ship cruise missile (ASCM0, and a comparable number of subsonic H-6D bombers (based on the Soviet 1950s-era Tu-16) armed with an improved version of a 1950s-era ASCM. Today, the number of JH-7s has quadrupled and they are now capable of carrying the improved, 180 km-range C-803K ASCM, and the number of H-6Ds has nearly doubled. Most significantly, the PLA has acquired a squadron of (i.e., 24) Su-30 MK2s armed with the supersonic Kh-31A (AS-17A) air-to-surface missile.

At one time PLAN aviation played an important role in defending China's airspace from attack, with the PLAN responsible for the air defense of certain sectors of China's coastal boundary. As the capabilities and ranges of the PLAAF's fighters and SAMs have improved, however, it appears that the air defense role of PLAN aviation has shrunk to simply defending naval bases from air attack.

Virtually all of the improvements I have discussed above are based on newer and more capable platforms and hardware. New platforms and hardware alone, of course, do not necessarily translate into improved capabilities. The organization, doctrine, and training to effectively employ,

and the logistics to maintain and supply, the platforms and hardware are also required. As noted above, however, China has been making progress in many of these dimensions as well. Conversely, without newer and more capable platforms and hardware, improvements in combat effectiveness would be difficult to achieve, as there is a limit to how much performance can be squeezed out of 1950s-era designs.

During the 1990s and the first half of the 2000s, most of the PLAAF and PLAN aviation's new platforms and hardware were imported, largely from Russia, with some technologies and equipment acquired from Israel and other countries. In recent years, however, this equipment has increasingly been domestically produced. In the area of fighter aircraft, for example, China now produces a single-engine fighter, the J-10, that is comparable in performance to the U.S. F-16, and a heavy fighter, the J-11B, that is an improved version of the Russian Su-27, which is regarded as superior in performance to the U.S. F-15. China now also produces AEW&C aircraft comparable to the U.S. E-2 Hawkeye and E-3 AWACS. And China is now in the process of developing a heavy airlift aircraft, which may explain why the PLAAF has not moved more aggressively to expand its airlift capacity by purchasing imported airlifters. Finally, China is developing long-endurance UAVs that are comparable in range and endurance to the U.S. Predator and Global Hawk.

In the area of munitions, China now produces a BVR active radar-guided air-to-air missile, the PL-12, that is comparable to the U.S. AMRAAM or Russian R-77 (AA-12), and a variety of laser-, TV-, and satellite-guided PGMs. In the area of SAMs, as noted above, China now produces the HQ-9, a system that is believed to be comparable in performance to the Russian S-300PMU1 (SA-20).

Future developments we can expect to see in China's aviation capabilities certainly include a fifth-generation fighter. Rumors of such a program and even photos of an alleged full-scale mockup have long circulated, and, last year, He Weirong, a PLAAF deputy commander, stated that such an aircraft was scheduled to enter service in the 2017-2019 timeframe. The specific capabilities of this aircraft, however, are unclear. The full-scale mockup photo suggested an aircraft with a reduced radar cross-section, though perhaps not in the class of the U.S. F-22 and F-35. At the rate at which China's electronics capabilities are progressing, an active electronically scanned array (AESA) radar and advanced data links for this aircraft seem plausible. Whether it will have the thrust-vectoring and supercruise capabilities of the F-22, however, is less certain.

Other than a fifth-generation fighter, moreover, what other aviation capabilities China will develop is much less clear. The commercial jetliner and jet airlifter that China is developing could also

form the bases for aerial refueling aircraft, and the technologies that China will acquire in the course of these two programs would also support the development of a long-range, heavy bomber, but I have not seen anything to suggest the existence of either a tanker or a heavy bomber program. Models of unmanned combat aerial vehicles (UCAVs) have been displayed at air shows, but these may merely represent conceptual projects produced purely for the purpose of showing off an enterprise's design capabilities at air shows, as opposed to actual development programs. What future air force capabilities China is likely to acquire is an area in which further research and analysis is needed.

A related question is whether China's Second Artillery Force, especially its conventional short-range and medium-range ballistic missile forces, obviates the need for traditional air platforms. The short answer is 'no' – traditional air platforms are still needed. However, China's conventional short-range and medium-range ballistic missile forces do provide unique capabilities that I would view as enhancing the effectiveness of traditional air platforms rather than obviating the need for them. The most important of these capabilities are speed and penetration. Ballistic missiles reach their targets within minutes of being launched. This minimizes the amount of warning time that the subjects of the attack have to respond. If the target is an air base for example, only a few of the aircraft on the ground at that base will be able to get into the air before the missiles arrive. Any aircraft that are in the air at the time the missiles arrive will not be able to actually help defend the airbase against the attack, but those that remain on the ground may be destroyed, if unprotected, or trapped there, if the effect of the attack is to damage the base's runways. Ballistic missiles, moreover, are very difficult to intercept. The actual combat effectiveness of current ballistic missile defense systems is questionable, and even the best missile defense systems could be overwhelmed by the sheer numbers of missiles China could launch simultaneously against them. In the U.S. military, reduced warning time and assured penetration capability are provided by stealth aircraft. For a country that does not have stealth aircraft, however, conventional ballistic missiles are a logical way of achieving the same effects, at least against targets on its immediate periphery.

The single-use nature of ballistic missiles means that they have important disadvantages relative to aircraft. China's entire inventory of conventional ballistic missiles, for example, could deliver about a thousand tons of high explosive on their targets. The USAF's aircraft, by comparison, could deliver several times that amount of high explosive every day for an indefinite period of time. Moreover, although the accuracy of China's conventional ballistic missiles is reportedly very good, they are still not as accurate as PGMs. The speed and penetration capabilities of conventional ballistic missiles, however, can significantly enhance the effectiveness of traditional air platforms by enabling the neutralization of enemy air forces. For example, conventional ballistic missiles

can be used to attack enemy air bases, destroying aircraft on the ground before they can be scrambled into the air and damaging the runways so that any aircraft not in the air at the time of the missile attack are trapped on the ground where they are vulnerable to more precise follow-on attacks by either the Second Artillery's ground-launched cruise missiles or aircraft with PGMs. Similarly, if China succeeds in developing a ballistic missile capable of hitting a moving ship at sea, as they are reportedly attempting to do, then an adversary's carrier-borne air forces could also be neutralized. Thus, China's Second Artillery forces should be seen not as a substitute for but rather as an effectiveness-multiplier for China's air forces.

China's air forces are no longer those of a third-world country. Improvements in China's air force capabilities, coupled with improvements in the conventional missile capabilities of its Second Artillery Force, mean that prevailing in an air war with China will be increasingly challenging. Continuing to carefully follow the development of China's air forces is vital to the security interests of the United States and I hope that the work we are doing at RAND, along with my testimony here based on that work, is making a valuable contribution to that end.