

**CHAPTER 2**  
**CHINA'S SECURITY-RELATED**  
**ACTIVITIES**  
**SECTION 1: CHINA'S MILITARY**  
**MODERNIZATION**

“The Commission shall investigate and report on—  
“REGIONAL ECONOMIC AND SECURITY IMPACTS—The triangular economic and security relationship among the United States, [Taiwan], and the People’s Republic of China (including the military modernization and force deployments of the People’s Republic of China aimed at [Taiwan]), the national budget of the People’s Republic of China, and the fiscal strength of the People’s Republic of China in relation to internal instability in the People’s Republic of China and the likelihood of the externalization of problems arising from such internal instability.”

**U.S. Perspectives on China’s Military Modernization**

Beijing’s most recent defense White Paper, *China’s National Defense in 2006*, outlines the objectives of China’s national defense policy and the course of its military modernization. Mr. Cortez Cooper, Director of East Asian Studies at Hicks and Associates, Incorporated, summarized these objectives in his testimony before the Commission:

1. *Uphold national security and unity, and ensure the interests of national development.*
2. *Provide the source of strength for consolidating the rule of the Communist Party ... and a solid security guarantee for sustaining this period of strategic opportunity for national development.*
3. *Guard against and resist aggression ... defend against violation of China’s territorial sea and air space, and borders.*
4. *Oppose and contain the separatist forces for Taiwan independence and their activities.*
5. *Take precautions against and crack down on terrorism, separatism, and extremism in all forms.<sup>1</sup>*

Although official Chinese statements and White Papers maintain that China’s security policy is purely defensive in nature, Mr. Cooper contends that the People’s Liberation Army (PLA) derives offensive missions from these objectives. Mr. Cooper further argues

that the requirement to deter Taiwan from pursuing independence is the core driver for the PLA's development of offensive missions.<sup>2</sup> The importance to China of this objective requires the PLA to possess the ability to launch offensive operations against Taiwan should it decide to do so, and to deter and delay the United States or other countries from assisting in Taiwan's defense.<sup>3</sup>

Contingencies involving Taiwan will remain the central focus of Chinese planning and force acquisition for the near term, and according to Dr. Bernard Cole, Professor at the National War College, the ability of Taiwan's defense forces to defend the island in the event of a Chinese attack is diminishing. In his testimony, he noted that while Taiwan's armed forces are arguably better trained than their PRC counterparts, they also are relatively under-armed in every service.<sup>4</sup> Dr. Cole emphasized the importance of this by noting that if armed conflict were to break out between the two, it is unlikely that Taiwan could withstand the pressure from the PRC for more than a few weeks. He also remarked that, even with the addition of the defense systems funded by the Special Budget that was stalled in the Legislative Yuan for more than five years, Taiwan's armed forces still would face a significant challenge to defending the island.<sup>5</sup> It is doubtful that the small portion of defense items finally approved by the Legislative Yuan in June 2007 will do much to decrease the strategic challenges faced by Taiwan.<sup>6</sup> Indeed, it has become the consistent criticism of the United States government over the past decade that Taiwan is not preparing sufficiently for its own defense and is too reliant on the potential intervention of U.S. forces. Notably, China is preparing for this potential intervention as it seeks to develop forces that can deter or effectively counter U.S. operations in and around Taiwan.

The U.S. Department of Defense's 2007 *Annual Report to Congress on the Military Power of the People's Republic of China* points out that China's first objective in order to prevent Taiwan's independence is to prepare its military to be able to pursue broader regional and global objectives.<sup>7</sup> Dr. James Holmes, Associate Professor at the Naval War College, testified that once China "secures the East, Yellow, and South China Seas to its satisfaction, Beijing will vector its nautical energies not eastward but toward the south and southwest, where its interests in energy security and economic development lie."<sup>8</sup> This mission includes protecting sea lanes that support the transport of resources vital to China's economic growth and securing China's territorial claims, as well as confronting regional threats of terrorism.

## **Components of Chinese Military Modernization**

### ***Expenditures versus Capabilities***

Western literature on Chinese military modernization, as well as Chinese National Defense White Papers, acknowledge that China presently is in the midst of a lengthy round of extensive military modernization with the aim of creating a professional, high-technology fighting force equal to those of the world's best militaries.<sup>9</sup> To this end, according to International Monetary Fund data, China raised its defense budget at an annual average rate of 11.8 percent (inflation adjusted) per year from 1996 to 2006.<sup>10</sup> When that rate

is compared to a GDP growth of 9.6 percent (inflation adjusted) per year during that some period, it is clear that military development is a high priority for Beijing.<sup>11</sup> In March 2007, the Chinese government news agency announced that China's defense budget would increase by 17.8 percent this year to a total of \$44.94 billion.<sup>12</sup> The Pentagon believes this figure is significantly understated and that China's actual defense budget is closer to two or three times this amount, or \$85–\$125 billion.<sup>13</sup> Because of the opacity of Beijing's expenditures, particularly those that are military-related, it is difficult for analysts to agree on precise figures.

In his testimony before the Commission, Defense Science Board Chairman William Schneider argued that looking at capabilities (outputs) rather than budgets (inputs) in these assessments “may in some ways be more informative than trying to calculate how the inputs are measured.”<sup>14</sup> The increasingly sophisticated capabilities purchased with such expenditures are readily demonstrated and serve as a good measure by which to judge the success of China's military modernization endeavor. While larger defense budgets do not necessarily reflect an increase in capabilities, in the case of Beijing's funding of the PLA's modernization, the Commission believes there is a strong correlation. Analysts and policymakers on numerous occasions have been surprised at the pace of China's achievements. Testifying before the Commission, Congressman J. Randy Forbes (4<sup>th</sup> District of Virginia) expressed his experience in witnessing China's military developments:

*The only thing . . . that continues to surprise me, is that our government continues to be surprised over and over again by what we find and what we see in the development of China.*<sup>15</sup>

In its 2006 Quadrennial Defense Review Report (QDR), the Department of Defense categorized the military threats facing the United States in four groups: (1) traditional warfare; (2) disruptive warfare, which relies upon asymmetric capabilities that exploit an opponent's weaknesses; (3) catastrophic warfare through the use of weapons of mass destruction (WMD); and (4) irregular warfare in which combat operations are carried out by dispersed, non-state actors such as terrorists.<sup>16</sup> The Commission used this framework to organize its March 2007 hearing on the progress China is making in modernizing its military. The analysis in this section focuses on the impact of newly acquired capabilities within these groupings, rather than on Chinese military expenditures. Because there is no evidence of which the Commission is aware that China is engaged in sponsoring or supporting irregular warfare, this analysis will address only the other three categories.

### **China's Traditional Warfare Capabilities**

The PLA is improving its traditional warfare capabilities by purchasing new advanced systems and by increasing the capabilities of its indigenously produced systems. As China surveys scenarios of potential future conflict, one of the most likely is a conflict over Taiwan in which the United States and/or Japan may intervene. This understanding has guided China's investment in its conven-

tional military forces over the last 15 years, during which the majority of the resources for weapons acquisition has gone to the Navy and Air Force rather than to the Army. Nonetheless, the current pattern of military acquisition also suggests that China is preparing consciously for other types of and locations for armed conflict (or efforts to deter conflict with shows of force).

Testifying before the Armed Services Committee of the U.S. House of Representatives in June 2007, then-Deputy Under Secretary of Defense for Asian and Pacific Security Affairs Richard P. Lawless noted improvements China has made in its conventional weapons, including the production of second generation nuclear powered submarines, fielding of air and amphibious lift capabilities, and introduction of new amphibious armored vehicles in ground forces based opposite Taiwan.<sup>17</sup>

### **Navy**

The PLA continues to modernize its Navy with an emphasis on those platforms that are best suited for littoral or “green water” operations. Chinese strategists are well aware of U.S. military assistance to Taiwan and are developing strategies and capabilities to deter or delay the arrival of U.S. forces in the theater. Chinese doctrine in this area stresses the use of pre-emptive, decisive strikes on forward bases and staging areas such as Guam and Okinawa, and employment of a variety of platforms to deny the operational use of the waters in the Chinese littoral.<sup>18</sup> Presently, the PLA Navy possesses the capabilities to maintain sea denial operations out to 400 miles from China’s coastline for a period of days.<sup>19</sup> By 2010 China is expected to be able to sustain such operations for a period of weeks.<sup>20</sup>

China has completed the acquisition of a fleet of a dozen Kilo-class submarines from Russia. It also obtained from Russia a complement of advanced SS-N-22 Sunburn and SS-N-27 Sizzler supersonic anti-ship cruise missiles,<sup>21</sup> the former to give its Sovremenny-class destroyers supersonic anti-ship missile capability and the latter to give its Kilo-class submarines and possibly also its Yuan-class submarines comparable anti-ship capability.<sup>22</sup> These low altitude, sea-skimming missiles were specifically designed for attacking U.S. aircraft carrier strike groups and to defeat the Aegis anti-missile system by employing a low cruising altitude and supersonic speed.<sup>23</sup> Simultaneously, the PLA Navy is launching ever-larger numbers of indigenously developed Song- and Yuan-class submarines, the latter of which may be equipped with an air-independent propulsion system for improved endurance.<sup>24</sup>

China’s Navy may not yet have a consistently reliable means to detect and target oncoming U.S. vessels, although it has a variety of means of acquiring limited targeting information.<sup>25</sup> Since 1996, PLA Navy officers have been seeking to develop the capability to attack a deployed aircraft carrier battle group with ballistic missiles. Recent Chinese military publications indicate that officers believe China is now able to achieve this military objective.<sup>26</sup> Additionally, China may be in the process of developing anti-ship homing warheads, which would make defending against oncoming anti-ship cruise missiles very difficult.<sup>27</sup>

The PLA Navy surface fleet also has made substantial progress in raising its air defense and surface warfare capabilities. Its three newest classes of surface combatants, the Luyang II and Luzhou-class destroyers and Jiangkai II-class frigate, are equipped with sophisticated air-search and missile guidance radars and long-range, vertical launch, surface-to-air missiles.<sup>28</sup> However, the anti-submarine warfare capabilities of these vessels are weak—as was the case with their predecessors.<sup>29</sup>

In his testimony, Dr. Andrew Erickson, Professor at the U.S. Naval War College, predicted that in the near term, naval power projection will remain lower on the PLA Navy's list of priorities than littoral operations.<sup>30</sup> Despite its shipyards' latent production capacity, China has not engaged in the serial production of replenishment-at-sea ships, considered essential for the re-supply of surface action groups engaged in blue water operations. Even though its shipyards are fully capable of building replenishment vessels, they are not being built, which suggests that the PLA Navy is limiting its short-term focus to scenarios closer to the mainland.<sup>31</sup>

Similarly, even though China has benefited from close to two decades of aircraft carrier design study, it still has not produced a single operational carrier platform. There are indications that the PLA Navy soon may refurbish the Russian carrier Varyag that it acquired from Ukraine and place it in an operational state.<sup>32</sup> Development of an aircraft carrier or a replenishment fleet would indicate a significant shift in China's naval objectives, namely the movement toward a more outward-looking force posture that would have the ability to conduct long-range missions for an extended period of time. If, as Mr. Cooper posits, China launches ten of its new nuclear-powered Shang-class submarines by the end of 2008, this development would suggest a new emphasis on blue water naval capabilities on the part of Chinese strategists.<sup>33</sup>

During its fact-finding trip to China in April 2007, the Commission visited the PLA Academy of Military Sciences. The officers at the Academy noted that they consider it their responsibility to defend Chinese interests in the region and around the world, and that this includes, especially, China's sources of energy. They believe this requires a force projection capacity that, in turn, necessitates development of a blue water navy. (See Chapter 3, Section 3 for further discussion of the role of energy security in China's determination to develop blue water naval capabilities.)

Chinese advancements in naval modernization have been so substantial that they are leading some experts to consider the possibility of China partnering with the U.S. Navy in protecting freedom of navigation and maritime security on the high seas, through participation in the "Thousand-Ship Navy" concept recently proposed by then-Chief of Naval Operations and current Chairman of the Joint Chiefs of Staff Admiral Michael Mullen.<sup>34</sup> French newswire *Agence France-Presse* reported that Admiral Mullen asked Chinese Navy leaders to consider participation in the initiative.<sup>35</sup> Rear Admiral (Retired) Eric McVadon, former U.S. Defense Attaché in Beijing, has confirmed that Admiral Mullen made the suggestion to PLA Navy leaders.<sup>36</sup> Testifying before the Commission, RADM McVadon said he also favors the idea.<sup>37</sup>

However, there are impediments to success in building such a partnership with China. According to section 1203 of the National Defense Authorization Act for Fiscal Year 2000, U.S. armed forces are restricted from engaging in certain cooperative activities with the PLA that would provide inappropriate access to advanced American technologies and capabilities.<sup>38</sup> This provision likely would not permit the U.S. Navy to engage in the forms of operational information sharing and strategic planning with the PLA Navy that would be required for such military-to-military collaboration.

### **Air Force**

China has always considered air superiority over the Taiwan Strait as a precondition for successful invasion of Taiwan. With the objective of achieving this superiority, it has heavily funded the PLA Air Force over the last 15 years. In the early 1990s, China abandoned its hope of building an advanced fleet of fighter aircraft through only indigenous means and instituted a two-track system of acquiring advanced fighters from abroad while continuing to pursue domestic programs. Today, the PLA Air Force possesses close to 300 of the Russian Sukhoi family of aircraft, including fourth generation, imported Su-27s and Su-30s, and licensed, co-produced Su-27s, designated the "J-11." It also is manufacturing in increasing numbers its first indigenous, light-weight, fourth-generation fighter, the J-10.<sup>39</sup>

China continues to rely primarily on foreign purchases to fulfill its requirements for strategic-lift and aerial-refueling aircraft, the former necessary for an invasion of Taiwan, and both necessary for effective power projection beyond China's borders. The IL-78 still serves as the mainstay for PLA Air Force aerial refueling, though it has been supplemented by H-6 bombers reconfigured for this purpose. According to Mr. Cooper, China recently agreed to a deal to purchase additional IL-76 transport aircraft from Russia that would increase its lift capacity for airborne forces by as much as 150 percent.<sup>40</sup>

As evidenced by its modernization trends, the PLA Air Force understands the importance of developing a fleet with information systems that can be integrated in a theater-wide command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) system. This type of integration is needed to conduct multidimensional combat operations, and, to that end, the PLA Air Force has sought to install data links in all its advanced fighter aircraft and to build or acquire airborne early warning aircraft. China's handful of Y-8 and KJ-2000 aircraft fulfills this latter requirement to a limited degree. Development of the KJ-2000 is China's answer to the United States blocking China's \$1 billion deal to purchase Israel's "Phalcon" early warning system in 2000. The KJ-2000 system provides a similar capability; it is based on the Russian A-50 airframe and uses indigenous phased array radar.<sup>41</sup>

## Army

Despite the fact that China's defense budget has favored the PLA Navy and Air Force over the last decade and a half, the modernization of China's ground forces constitutes an important component of the overall development of China's armed forces. The Army continues to train in combined arms warfare and to focus on improving the quality of its infantry, armor, and artillery operations. However, unlike the Air Force and Navy, the Army has developed no new major weapon systems indigenously. Most of the modernization of the Army is done by adapting new technologies to old platforms. This includes integrating better C4ISR hardware, which allows the Army to participate in joint operations with the Navy and Air Force, and to train in the types of air mobile and amphibious assault operations that it would be called upon to undertake in a potential conflict over Taiwan. According to Mr. Cooper, about a quarter of the PLA's maneuver divisions and brigades focus on training for amphibious operations at four or more major amphibious training bases.<sup>42</sup>

The Army also is modernizing its doctrine and training programs. Even though training across the Army continues to lag behind that of the PLA Navy and Air Force, in recent years the U.S. Department of Defense has witnessed significant efforts dedicated to improving the professionalism and effectiveness of all PLA services. These efforts include developing a professional non-commissioned officer corps, improving the professional military education programs for officers, reforming and improving the quality of training, raising the pay of enlisted personnel, and emphasizing integration of information technology in daily operations.

## Second Artillery

China's ballistic missile force, consisting of medium- and short-range ballistic missiles, constitutes a crucial component of the force arrayed against Taiwan and is expected to fulfill an important theater-level precision strike role for China if armed conflict should arise. Presently, the Second Artillery's arsenal of 900 short-range ballistic missiles is being augmented at a rate of roughly 100 missiles per year.<sup>43</sup> Additionally, the lethality of these missiles has increased through the development of more sophisticated warheads.<sup>44</sup> Chinese ballistic missiles can hit U.S. bases in the Western Pacific where a large number of U.S. forces are based. Some longer range missiles such as the CSS-3 and CSS-2 are capable of targeting locations not only in Taiwan but also in Okinawa, Japan, and Guam.<sup>45</sup> (See the map on page 13.)

One final development in China's conventional missile force opposite Taiwan is noteworthy. The Second Artillery is designing a variant of the DF-21 intermediate-range ballistic missile with a maneuverable reentry vehicle (MaRV).<sup>46</sup> This weapon could be very difficult for U.S. carrier groups to defend against due to its maneuverability and its extremely high terminal speed. In addition, according to RADM (Ret) McVadon, it appears that these missiles may incorporate advanced penetration aids. However, because the DF-21's guidance system does not allow much flexibility in the missile's flight trajectory, it could have difficulty striking a U.S.

vessel if the vessel is moving at full navigation speed. The Aegis system used by U.S. carrier groups gives American ships enough advanced warning of incoming missiles that evasive action can be taken. Yet, even if a successful strike on a U.S. carrier cannot be achieved, the prospect of such a strike could accomplish “coercive isolation” of American vessels—causing U.S. carrier groups responding to a Taiwan crisis to operate further out from the Taiwan Strait combat theater,<sup>47</sup> thus making air operations in the Strait vicinity more difficult.<sup>48</sup>

### **Integrated Operations**

The PLA’s understanding of joint operations (*lianhe zuozhan*) is similar to that of the United States. These operations involve the coordinated use of all the military services (Army, Navy, and Air Force) and their integrated arms and branches.<sup>49</sup> Recently, the PLA has expanded its military doctrine to include the concept of integrated operations (*yiti zuozhan*). Integrated operations are joint, and are conducted across and throughout all of what the PLA defines as the domains of war: land, maritime, air, space, cyber-space, and the electromagnetic spectrum.<sup>50</sup> Integrated joint operations require central command and control that direct and coordinate the missions of the full spectrum of force components. This level of integration across the service branches requires information networks to transmit battle space awareness data and joint strike commands. The infusing of information-network hardware and technology necessary for such integrated command and control into military systems and doctrine is what PLA writings refer to as informatization.<sup>51</sup> Dr. James Mulvenon, Director of the Center for Intelligence Research and Analysis at Defense Group, Incorporated describes the concept in the following terms:

*The integration of advanced [information technology] into the PLA’s hybrid inventory of near-state-of-the-art and older systems is the heart of what the PLA calls “informatization,” which is a primary dynamic driving the central warfighting scenario of “local, high-tech wars under informatized conditions.”*<sup>52</sup>

According to Mr. Cooper’s testimony, China’s weapons acquisitions and training are guided by this desire to win “informatized wars,” or wars that are heavily reliant on computers and information systems.<sup>53</sup> Beijing’s strategists believe that future conflicts involving China will be limited in geographical scope, duration, and political objectives, and will be highly dependent on command, control, communications, and computer (C4) systems.<sup>54</sup> Thus, the ability of China’s military forces to integrate their operations, increase their awareness of the battlefield, and coordinate the execution of commands influences the direction of China’s military acquisitions and personnel training.

A more integrated architecture achieved through the use of more advanced C4ISR systems would enable the PLA to conduct joint operations and to fuse data from intelligence, surveillance, and reconnaissance (ISR) assets into a near real-time sensor-to-shooter network. Such advances have the potential to give the PLA over-the-

horizon strike capabilities; non-kinetic, counter-C4ISR capabilities; and ability to perform air superiority, airborne, and air-mobile operations.<sup>55</sup> These new capabilities not only make the PLA a more formidable opponent on the battlefield, but also will require any U.S. carrier battle group intervening in the defense of Taiwan to operate at a much greater distance from China's coast.

### **China's Disruptive Warfare Capabilities**

Disruptive warfare is a form of non-traditional, asymmetric warfare that aims to undermine an opponent's strengths by exploiting weaknesses.<sup>56</sup> DoD believes that China's logical strategy is to favor asymmetric capabilities that target and exploit the weaknesses of China's militarily superior opponents, especially the United States, increasing the potential that China can defeat them.<sup>57</sup>

According to Dr. Ehsan Ahrari, professor at the Asia-Pacific Center for Security Studies, China seems to have found its niche in fielding various weapon systems such as cyber weapons and anti-satellite weapons that are specifically designed to wage this type of warfare.<sup>58</sup> The trend in China's military modernization toward fielding disruptive capabilities is so unmistakable that the 2006 QDR stated:

*Of the major and emerging powers, China has the greatest potential to compete militarily with the United States and field disruptive military technologies that could over time offset traditional U.S. military advantages absent U.S. counter strategies.<sup>59</sup>*

Mr. James Lewis, Director of the Technology and Public Policy Program at the Center for Strategic and International Studies, explains why the development of disruptive capabilities is particularly appealing to China:

*China's military is not a peer to the U.S., but it is a challenger. The challenge comes from a combination of increased conventional capabilities and from the pursuit of asymmetric advantage—using new weapons and tactics to attack an opponent in areas where it is weak or vulnerable. Seeking asymmetric advantage is not new, nor is China the only country to seek it. What is new is the means that U.S. opponents like China and others plan to use to gain asymmetric advantage. One part of the modernization effort looks for ways to counter U.S. force projection capabilities. Other modernization efforts look for ways to erode the U.S. military advantage by attacking information and communications assets, including satellites and networks.<sup>60</sup>*

This approach to warfare offers China a possible solution to the disparity between the capabilities of the PLA and U.S. forces, while not requiring China to build a military fully equal to that of the United States.<sup>61</sup>

Among the disruptive capabilities China is fielding is the ability to conduct cyber attacks. General James Cartwright, then Commander of the U.S. Strategic Command (USSTRATCOM) and currently Vice Chairman of the Joint Chiefs of Staff, testified before

the Commission that China is actively engaging in cyber reconnaissance by probing the computer networks of U.S. government agencies as well as private companies.<sup>62</sup> The data collected from these computer reconnaissance campaigns can be used for myriad purposes, including identifying weak points in the networks; understanding how leaders in the United States think; discovering the communication patterns of American government agencies and private companies; and obtaining valuable information stored throughout the networks. General Cartwright testified that this information is akin to that which in times past had to be gathered by human intelligence over a much longer period of time. He went on to say that in today's information environment, the intelligence exfiltration that once took years can be accomplished in a matter of minutes in a single download session.<sup>63</sup>

General Cartwright also addressed another type of cyber attack that disables computer systems or networks by overloading them with commands. This form of attack, known as denial of service, has the potential to cause cataclysmic harm if conducted against the United States on a large scale.<sup>64</sup> China currently is thought by many analysts to have the world's largest denial-of-service capability.<sup>65</sup> General Cartwright presented his view of the seriousness of a large scale denial-of-service attack:

*The [Chinese] capabilities that are most intriguing are their dedication to, one, bringing [cyber warfare] into their military structure; two, building schools all the way through doctrine, et cetera, and [establishing] plans to be able to use this type of capability in a military context . . . I don't think the [United States] has gotten its head around the issue yet, but I think that we should start to consider that regret factors<sup>66</sup> associated with a cyber attack could, in fact, be in the magnitude of a weapon of mass destruction.<sup>67</sup>*

A delegation of Commissioners met with officers from the PLA's Academy of Military Sciences while in China in April 2007. When questioned about cyber attacks, officers noted that scholars hold differing opinions about whether a computer network attack may constitute an act of war. Some argued it meets that definition, but others argued that a network attack alone without corresponding conventional attacks does not constitute an act of war. However, the PLA officers acknowledged that if a cyber attack targets military capabilities of another country and does significant damage, conventional counterattacks are warranted. They also noted the frequent difficulty in accurately identifying the source of cyber attacks and argued that the source must be clearly identified before a counterattack could be responsibly launched.

In addition to cyber attacks, Chinese leaders are interested in developing disruptive capabilities for anti-satellite missions as well. China's free-electron and chemical oxygen-iodine high energy lasers could be used to permanently or temporarily blind satellites, as was demonstrated when China temporarily blinded a U.S. satellite in late 2006.<sup>68</sup> Chinese researchers also have begun testing high power microwave weapons that could be used to jam satellite communications.<sup>69</sup> The successful anti-satellite test conducted by the

PLA in January 2007 demonstrated the PLA's ability to destroy satellites through the use of kinetic weapons as well. The kill vehicle was placed atop a DF-21 medium-range ballistic missile (MRBM) that reportedly was launched from a land-based mobile system.<sup>70</sup> The road-mobile launch capability provides built-in survivability, because such mobile systems are difficult to target, and thus make retaliatory or preemptive counterstrikes problematic. Deputy Under Secretary Lawless explained to the Commission why the Chinese leadership most likely was aware of the test:

*The suggestion that the Chinese leadership ... may not have known about the test I find rather farfetched. Hu Jintao is the Chairman of the Central Military Commission. This engagement that we have with them, albeit at an embryonic stage, is in a critically important area and the leadership of China understands the importance we assign to the weaponization of space and space activities. So it is hard to imagine that this was a surprise to the leadership of China. If it was a surprise, then we have a different problem, but I don't believe it was.<sup>71</sup>*

During the Commission's April 2007 visit in China, Mr. Xie Feng, Ministry of Foreign Affairs Director General for North American Affairs, told Commissioners that President Hu was aware of the test beforehand.<sup>72</sup>

#### **An Assessment of China's Anti-Satellite and Space Warfare Programs, Policies, and Doctrines**

The Commission received information through its public hearings and classified defense and intelligence briefings during 2006 concerning China's anti-satellite and space warfare programs, policies, and doctrines, and concluded that it needed more information about China's activities and intentions in these areas. In October 2006, the Commission commissioned research to examine Chinese military literature in the public domain for any such information.

The research, drawing from nearly 100 Chinese sources, identified 30 proposals and recommendations by Chinese military leaders to the Chinese political leadership regarding the development of space and counter-space weapons and programs. Among these proposals and recommendations are:

- ensuring that development and construction of Chinese space and counter-space weapons are conducted covertly so China can maintain a positive international image
- supporting the development of civilian technologies that also can be applied to military space programs
- acquiring the ability to destroy or temporarily incapacitate every enemy space vehicle when it is located above China
- acquiring the ability to attack the American global positioning system (GPS) through various means including anti-satellite weapons, high energy weapons, high energy weather monitoring rockets, and ground attacks on earth-based stations

**An Assessment of China's Anti-Satellite and Space Warfare Programs, Policies, and Doctrines—Continued**

- developing Chinese stealth satellites
- developing a Chinese space program to provide key support for Chinese combat forces

Some of these proposals appear to have been implemented already, as evidenced by January's kinetic anti-satellite test and earlier laser incidents involving American satellites.

**China's Catastrophic Warfare Capabilities**

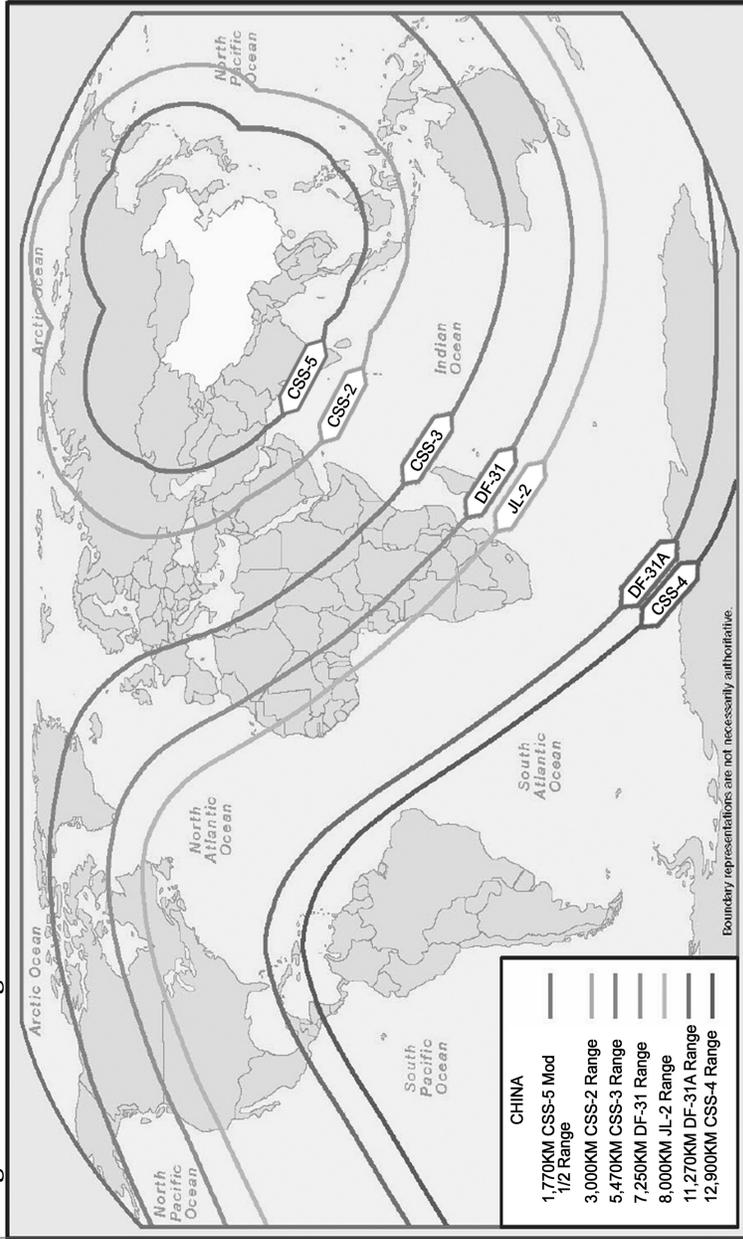
Catastrophic forms of warfare include the use of nuclear missiles and other WMD against an opponent. The PLA's capacity to wage catastrophic warfare is improving, as development continues on both the nuclear and conventional components of China's strategic missile forces under the control of the Second Artillery.

Although China officially maintains a "no first use" policy with respect to its nuclear weapons, it is engaged in the modernization of its nuclear arsenal to improve both the survivability and the range of its strategic nuclear missile forces.<sup>73</sup>

Presently, China has two different systems of land-based ballistic missiles capable of targeting substantial portions of the United States. Its land-based, solid-fuel, road-mobile DF-31A intercontinental ballistic missile constitutes its strongest means of nuclear deterrence. With an 8,000 mile range, it is capable of rapid deployment against targets throughout Asia, Europe, Africa, and North America; it is at low risk from retaliatory or preemptive strikes because of its mobility, and the rapid launch capability offered by solid fuel technology.<sup>74</sup> The older CSS-5 road-mobile, solid-fuel MRBM has similar characteristics, but its much shorter range limits it to regional missions.<sup>75</sup> The Chinese nuclear arsenal also presently includes nearly 60 nuclear-armed missiles of various ranges that rely on older liquid fuel technology—significantly increasing launch preparation time. Included in this group of missiles are approximately 20 silo-based CSS-4 ICBMs capable of reaching any target in the United States, approximately 20 CSS-3 ICBMs capable of targeting most of Asia and Europe and parts of Alaska, and between 14 and 18 CSS-2 intermediate-range ballistic missiles (IRBMs) with a much shorter range, capable of targeting only locations within Asia.<sup>76</sup>

With the introduction of the DF-31's sea-launched naval counterpart, the JL-2, on the Jin-class submarine, China will possess an even more survivable nuclear deterrent that could target most locations in the United States from protected underwater locations off China's coast.<sup>77</sup> The older version, the JL-1, launched from Xia-class submarines, is capable of only regional deterrence missions much like its land-based counterpart, the CSS-5.<sup>78</sup>

Figure 2.1 Ranges of China's Ballistic Missiles



Source: U.S. Department of Defense, Annual Report to Congress on the Military Power of the People's Republic of China. (Washington, DC: July 2007), p. 19. Range ring labels added by U.S.-China Economic and Security Review Commission for black and white printing.

### **The Strengthening of the Chinese Defense Industrial Base**

In addition to the doctrinal and operational evolution of the PLA's forces, the Chinese military industrial complex is modernizing to provide the weapon systems and components needed to achieve PLA objectives. While China still imports a host of systems from Russia and other partners to fill critical gaps in the short term, Chinese defense manufacturers increasingly are becoming able to develop indigenous systems with new capabilities.<sup>79</sup>

Chinese leaders have adopted a "grand strategy" for the modernization of the defense industry.<sup>80</sup> This strategy calls for a three-pronged approach to accomplish a rapid defense industrial transformation: (1) selective modernization,<sup>81</sup> (2) civil-military integration,<sup>82</sup> and (3) acquisition of advanced foreign weapons and technologies.<sup>83</sup> The implementation of this three-pronged strategy as well as a number of structural changes in China's defense ministries and state-owned defense companies have continued to bring about positive developments for the Chinese defense industry.

#### ***Selective Modernization***

China's leaders have recognized that the size of China's economy, although rapidly growing, and the general technological deficiency throughout the country, make it difficult and expensive to develop an indigenous capacity to produce advanced weapon systems across all sectors.<sup>84</sup> Thus, Chinese defense industries are giving priority to sectors that are critical to PLA strategic objectives.

Chinese shipyards are now building second-generation nuclear powered submarines, newly-designed frigates, and a large fleet of oil tankers to support naval operations in the event of a Taiwan conflict that would require carrying out blockade or sea lane denial missions, as well as delaying or deterring support from other countries. The shipyards also have the ability to produce replenishment vessels if they choose to do so.<sup>85</sup> In his testimony before the Armed Services Committee of the U.S. House of Representatives, then-Deputy Under Secretary of Defense Lawless highlighted two classes of submarines, the Jin and the Shang classes, as particularly good examples of the seriousness with which China's leaders view the role and military utility of a modern submarine fleet.<sup>86</sup> The first Jin-class nuclear powered ballistic missile submarine is still undergoing testing and is expected to be commissioned in 2008.<sup>87</sup> The two Shang-class nuclear powered attack submarines built by Huludao Shipyard, and designed with the help of Russian experts, are reported to have begun sea trials in 2005.<sup>88</sup> The recent launching or current production of these advanced, Chinese-built submarines indicates a rapid modernization of Chinese shipbuilding capabilities.

Additionally, Chinese shipyards are building modern destroyers and frigates. The Luzhou-class guided missile destroyer and Jiangkai II guided missile frigate complement China's improvements in submarine technology with enhanced anti-surface and anti-air capabilities—defense industry achievements also noted by Deputy Under Secretary Lawless.<sup>89</sup>

As another part of its selective modernization component, the Chinese defense industry is capitalizing on China's strengths in the

aerospace and missile industries.<sup>90</sup> Space and counter-space capabilities have considerable implications for carrying out disruptive missions in Taiwan Strait contingencies, as well as other possible missions involving space-dependent adversaries. The United States would lose a significant technological edge if space-based assets were not available in such a conflict. Mr. Eric Hagt, Director of the China Program at the World Security Institute, explained China's interest in pursuing anti-satellite capabilities in his testimony before the Commission:

*In the past decade, China has derived a number of key conclusions from its observations of U.S. military activities in space that have fundamentally shaped China's own strategic posture. The first is the profound implications of space for information and high-tech wars. China witnessed with awe and alarm the power of the U.S. military using satellite communication, reconnaissance, geo-positioning, and integration capabilities for an impressive show of force beginning first with the Gulf War in 1991, to the recent campaign in Afghanistan and Iraq. The U.S. military's almost complete dependence on space assets has not escaped the close examination of Chinese analysts. ASATs are seen by some analysts as weapons in line with China's asymmetric military strategy to hit enemies' vulnerable and hugely expensive assets in space with relatively cheap and easy countermeasures.<sup>91</sup>*

In describing the importance that Chinese leaders attach to modernization of the aerospace industry, the 2007 *Military Power Report of the People's Republic of China* includes the following quote from Premier Wen Jiabao:

*China's aerospace industry is standing at a new starting point and facing new situations and tasks ... It is now necessary to implement the principle of independent innovations; leaps in key areas ... carry out major state science and technology special projects in manned space flights and a lunar probe, and achieve new breakthroughs in research and development [of] aerospace equipment and ... space technology.<sup>92</sup>*

Chinese aerospace companies are now producing advanced imagery and reconnaissance satellites capable of military applications, and have plans to field satellites capable of infrared, multispectral, and synthetic aperture radar imaging.<sup>93</sup> Moreover, Chinese aerospace companies have developed and launched an indigenous navigation satellite constellation in which a group of carefully placed satellites working together provides a larger operational picture than any single satellite could provide. Four Beidou navigation satellites already have been launched over China and surrounding regions. The technology used in the satellites allows accuracy within 20 meters—a significant improvement in accuracy and precision over the capability of previous Chinese satellites.<sup>94</sup> Chinese aerospace companies also can take some credit for the success in recent years of China's manned space program. These firms will be tasked to provide the technology and hardware that will be used

in China's first space walk in 2007–2008 and China's first manned space station, scheduled to be launched in 2020.

In June 2007, the Commission received multiple briefings from the science and technology directorates of the Department of Defense and the military services at Wright-Patterson Air Force Base in Ohio addressing China's recent science and technology activities and accomplishments. The Commission learned that China graduates more than triple the number of bachelor of science-level engineers the United States graduates, and that Chinese research and development (R&D) has achieved world-class expertise in energetics, electronics, nanomaterials, optical communications, and metallurgy.<sup>95 96</sup> (See additional material concerning China's science and technology progress in Section 3 ["China's Science and Technology Activities and Accomplishments"] of this Chapter.)

### ***Civil-Military Integration***

In addition to the selective modernization of key sectors, the Chinese defense industrial base also seeks to benefit from increased civil-military integration. Economic transfers in key civilian industrial sectors are contributing to the modernization of the defense industrial base and, in turn, to advances in China's military capability. Dr. Mulvenon describes this civil-military integration phenomenon within the context of what he calls a "digital triangle." In his testimony, he stated:

*The pace and depth of [defense industry] advances cannot be explained by traditional Chinese defense-industrial dynamics, but instead spring from a paradigm shift known as the "digital triangle," which resembles a classic techno-nationalist strategy, with high-level bureaucratic coordination and significant state funding. The three vertices of the "digital triangle" are (1) China's booming commercial information technology companies, (2) the state R&D institute and funding infrastructure, and (3) the military. The linkages [among] these three vertices are longstanding, as telecommunications and information technology in China were originally under military auspices and the commercial relationships with state and military research institutes remain important.<sup>97</sup>*

The digital triangle phenomenon is facilitated further by two technological trends in China: the increasing utilization of commercial off-the-shelf (COTS) systems in military applications, and the ascent of China as a hub for global fabless integrated circuit production.<sup>98</sup> The digital triangle gives the PLA access to the advanced microelectronics that make up the core of modern military sensors and weapons systems.<sup>99</sup>

Dr. Tai Ming Cheung, Research Fellow at the Institute for Global Conflict and Cooperation at the University of California/San Diego, identified several key advantages for both the civilian and defense sectors when they are closely connected.<sup>100</sup> He explained the thinking of Chinese leaders in deciding to adopt this approach:

*The Chinese authorities view a strategy of embedding the defense industry within the broader civilian economy as*

*playing a central role in supporting the long-term modernization of the country's military capabilities, especially in technological innovation, as well as in the development of the country's S&T establishment.*<sup>101</sup>

Deng Xiaoping's famous sixteen character declaration about the intertwining of civil and military spheres set this thinking in motion in the 1980s: "Combine the military and civil, combine peace and war, give priority to the military, and let the civil support the military." In the early 1980s, Chinese defense industries saw their entrance into the civilian market as a way to generate profits, but today defense companies see their participation in the civilian sector as their door to dual-use technologies and manufacturing expertise that can be grafted into their military production lines.<sup>102</sup> Profits from commercial products manufactured by defense company subsidiaries are still seen as a valuable offset to government subsidies, and still comprise over 80 percent of defense industry aggregate output.<sup>103</sup> The Commission is submitting a classified report to Congress that will provide additional information on the state of China's S&T establishment and its accomplishments.

As noted in Chapter 1, Section 2 ("The Control of China's Economy by its Government, and the Effects on the United States"), the Chinese government is supporting certain key sectors to build up "national champions" and benefit from domestic economies of scale. Dr. Barry Naughton, Professor at the Graduate School of International Affairs at the University of California/San Diego, explained in his testimony before the Commission why the Chinese see civil-military integration as a favorable approach to military modernization:

*In the defense industry ... as in other aspects of technology policy, the Chinese have looked back over what they've done over the last couple decades and they've realized that many of their initiatives have failed. Moreover, in the defense industry, the record of the '80s and early '90s was pretty bad from their standpoint. So they have looked a lot at the U.S. and a lot at Japan, and they've recognized that they would be much better off with a vastly stronger civilian capacity that would strengthen their dual-use capabilities ... [T]hey've recognized that a sealed off, top-down command and control defense industry structure just isn't efficient enough to give them the kind of technological and security output that they want. So they've moved towards a much more open structure. There are a few important non-state-owned firms that have enough of a capability in high-tech sectors that they can start to provide dual-use items.*<sup>104</sup>

Another area of growing cooperation between civilian and military sectors is between defense industries and civilian universities and research institutes. These partnerships provide a venue for transferring discipline-specific knowledge and educational training from civilian institutions to industry production lines. In 2002, the Commission of Science, Technology, and Industry for National Defense (COSTIND) gave several million renminbi to at least two aerospace and ship-building academies in Jiangsu Province to help cultivate their defense-related programs and to recruit students in-

terested in defense research.<sup>105</sup> While partnerships in aerospace and shipbuilding sectors are common, the area of greatest industry-university cooperation is in the information technology sector.<sup>106</sup>

### ***Acquisition of Foreign Equipment and Technology***

The third prong of China's defense industrial base modernization strategy is to acquire advanced foreign equipment and technologies. While in some cases Chinese planners have chosen to purchase entire weapon systems directly, as they have done with many of the procurement agreements China has with Russia, some Chinese and Western analysts do not see this as beneficial for the long-term modernization of China's defense industry.<sup>107</sup> Direct purchases are generally used as a temporary measure to fill critical gaps that China's indigenous defense companies are unable to fill. Some items purchased from foreign companies are dual-use components—those that can be used in military as well as civilian applications such as computers, semiconductors, software, telecommunications devices, and integrated circuits.<sup>108</sup>

Partnerships forged between foreign companies and Chinese civilian companies also offer Chinese defense industries access to advanced foreign technologies. The nature of the regulatory and commercial environment in China places enormous pressure on foreign companies, including those of the United States, to transfer technology to Chinese companies as a part of doing business in China and to remain competitive globally.<sup>109</sup> Foreign companies are willing to provide not only technology but capital and manufacturing expertise in order to secure market access in China.<sup>110</sup>

Even so, it is not always easy for Chinese companies to obtain some of the most advanced technologies found in industrialized nations. Export control laws in most advanced industrial nations strictly regulate the transfer of technologies identified as having national security implications, and companies in those nations are prevented from transferring the covered technologies to persons or organizations in other nations except under carefully specified conditions. In some of these cases, access to restricted foreign technology is obtained by China through industrial espionage; China operates an aggressive clandestine effort to acquire additional technologies.<sup>111</sup>

In recent years, this has become such a problem in the United States that U.S. Immigration and Customs Enforcement officials have rated China's espionage and industrial theft activities as the leading threat to the security of U.S. technology.<sup>112</sup>

### **Recent Chinese Espionage Prosecutions in the United States**

The first conviction under the Economic Espionage Act involved Fei Ye and Ming Zhong who were caught in 2001 attempting to transfer to China proprietary technology owned by two American companies.<sup>113</sup> The two men set up a company in China, which, in exchange for a percentage of profits, was to receive local and provincial funding, in addition to funding that the two men expected to receive from the National High Technology Research and Development Program of China, commonly known as the "863 Program."<sup>114</sup>

Defense contractor employee Peter Lee was found guilty in 1997 of transferring sensitive submarine tracking technology to Chinese scientists.<sup>115</sup>

Katrina Leung was an FBI double agent who was indicted in 2003 for transferring large quantities of classified FBI counter-intelligence information to China's intelligence service, the Ministry of State Security. The case later was dismissed for prosecutorial misconduct.<sup>116</sup>

A chemist, Gary Min, was found to have obtained documents containing industrial secrets from his American employer. Court documents indicated that the company feared that the information would be highly valuable to Chinese companies. Min pled guilty to charges of stealing trade secrets in 2006.<sup>117</sup>

An engineer for an American defense contractor, Chi Mak, along with his wife, son, brother, and sister-in-law, was charged with conspiracy to export defense articles when he attempted to transfer U.S. Navy submarine engine secrets to China.<sup>118</sup> When Mak's house was searched, Chinese documents were discovered listing a number of sensitive U.S. naval systems and related technologies, including the submarine propulsion design technologies that he was caught attempting to take to China on encrypted disks.<sup>119</sup>

Xiaodong Sheldon Meng was an employee of an American software company who was convicted of selling to the PLA embargoed software used for U.S. Air Force and Navy training, and for attempting to sell proprietary technology to China's Navy Research Center.<sup>120</sup> He installed the American military software, which he altered to give the appearance that it was developed by his new Chinese employer, on PLA computers. Meng, who will face sentencing in January 2008, was the first to be convicted for exporting proprietary software under the Arms Export Control Act and the second to be convicted under the Economic Espionage Act of 1996.<sup>121</sup>

The box above contains key information about several prosecutions for the illicit activities of persons obtaining technological information for the PRC. Successful prosecutions, however, are the exception; scores of other instances of espionage go unprosecuted or

undetected.<sup>122</sup> All the while, the Chinese government staunchly maintains it is not involved in espionage and denies being engaged in any intelligence gathering against the United States.<sup>123</sup> Mr. Joel Brenner, the top counterintelligence official in the office of the director of national intelligence, has noted that of the 140 foreign intelligence agencies continuously attempting to penetrate U.S. agencies, China is the most aggressive.<sup>124</sup> The FBI stepped up counterintelligence efforts against Chinese intelligence operations in the United States in July 2007, because of what FBI Director Robert Mueller called a “substantial concern” about those operations.<sup>125</sup> As Chinese espionage against the U.S. military and American businesses continues to outpace the overwhelmed U.S. counterintelligence community, critical American secrets and proprietary technologies are being transferred to the PLA and Chinese state-owned companies.<sup>126</sup>

### **Conclusions**

- Several Chinese advances have surprised U.S. defense and intelligence officials, and raised questions about the quality of our assessments of China’s military capabilities.
- Chinese military strategists have embraced disruptive warfare techniques, including the use of cyber attacks, and incorporated them in China’s military doctrine. Such attacks, if carried out strategically on a large scale, could have catastrophic effects on the target country’s critical infrastructure.
- China has developed an advanced anti-satellite program consisting of an array of weapons that could destroy, damage, or temporarily incapacitate an adversary’s satellites. The use of high energy lasers to temporarily blind U.S. satellites in late 2006 and the use of a direct-ascent anti-satellite kinetic weapon to destroy an aging Chinese satellite in early 2007 demonstrate that China now has this capacity.
- The Chinese defense industry, while still lagging far behind that of the United States, has begun achieving noteworthy progress over the past years. New generations of warships, fighter aircraft, spacecraft, submarines, missiles, and other sophisticated weapon platforms are coming off production lines at an impressive pace and with impressive quality.
- The pace at which each of China’s defense industrial sectors is modernizing varies in direct proportion to its degree of integration in the globalized production and R&D chains, because such integration provides access to the most up-to-date technologies and manufacturing expertise.
- China is supplementing the technologies that its defense industry obtains through commercial transfers and direct production partnerships with an aggressive and large-scale industrial espionage campaign. Chinese espionage activities in the United States are so extensive that they comprise the single greatest risk to the security of American technologies.