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**China's Military Ambitions**

**In Space**

by

Larry Wortzel and Dean Cheng

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# *China's Military Ambitions in Space*<sup>1</sup>

Larry Wortzel and Dean Cheng

November 28, 2006

**Jeff Kueter:** Good afternoon everyone. It is my great pleasure to welcome you all to another installment of the Washington Roundtable on Science and Public Policy. As many of you know, the Roundtable series is a continuing program designed to bring together scientists, engineers, the media and other members of the policy community to discuss issues of significance.

The preservation of American power in space is a national security question of significant concern. When evaluating U.S. security interests, two factors appear to me to be self-evident. The first is that we must be wary of projecting today's international environment into the future. Tomorrow's challenges will not be the same as today's, just as we would not have expected to be where we are today fifteen years ago. Given that it takes so long to produce and deploy space systems, it is particularly important to recognize the spectrum of options and opportunities that will confront us in the future. The second is that space is and will remain a key enabler to national power. By national power I don't mean just hard power, but also soft power. The civil and commercial side of space is increasingly important to our economic prosperity. Space will continue to have a critical role in our hard power assets as well. I think that will only continue to intensify in the future. So given those two points, we cannot assume that the United States will remain the primary power in space going into the future. Other nations have capabilities in space and will continue to grow them.

China is a particularly apt illustration of that point. China's highly publicized exploration program and its commercial prowess are indicators of a growing means and interest in space activities. The discussion today will explore China's military goals and intentions and how it builds off those commercial and civilian technological capabilities. The speakers are also asked to discuss what they believe the implications for this emergence of China as a space power are for U.S. policy. I am pleased to welcome Dr. Larry Wortzel, a retired colonel in the United States Army, a leading authority on China and Asia, intelligence issues, foreign policy, national security and space policy, as well as Mr. Dean Cheng, who tracks Chinese military and technology issues at CNA Corporation's Project Asia. Dean Cheng will lead off and Dr. Wortzel will conclude. Please join me in welcoming both speakers.

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<sup>1</sup> The views expressed by the authors are solely those of the authors and may not represent those of any institution with which they are affiliated.

**Dean Cheng:** Good afternoon and thank you all very much for being here. I would like in particular to thank the Marshall Institute and Jeff Kueter for having us. My talk this lunchtime I have entitled *Taikong, Zuihou de Bianjing: Space, the Final Frontier*. With the entry of China into the exclusive club of manned exploration of space, as well as their discussions about fielding only the third set of satellite navigation systems, Beijing has made it clear that it is joining the United States and Russia as a major space power. What is less clear, however, is what kind of space power China will likely prove to be. My comments today are intended to provide some context for, I hope, subsequent discussion.

First, a brief history of the Chinese space program, aiming to highlight the fact that the level of effort being devoted to space is supported by the highest levels of the Chinese government; second, an examination of current Chinese space capabilities, not only in terms of things like command program, but their overall space potential; and finally, what I think are some of the potential implications of China's space capabilities, particularly from the military perspective.

It is important in setting the stage to recognize that the Chinese space program, while not necessarily *sui generis*, is by no means a mirror image of the American or Soviet programs. The apparent absence of early warning satellites, including missile launch and nuclear detonation satellites, suggests that it has somewhat different programmatic objectives than those of the two superpowers. Instead, where the U.S. and Soviet programs, especially in the very early days, were already aiming towards military intelligence objectives, along with issues of space science, Chinese writings have often emphasized instead the drive for prestige being a central factor and subsequently civil-military integration of the PRC's aerospace industries. The aim has generally been to contribute to what is termed "comprehensive national power" rather than to establish military capability per se. Nevertheless, the People's Liberation Army (PLA) is today showing steadily growing interest in space as reflected in their thinking about future warfare. So with these points in mind, I would like to review briefly the history of the Chinese space program.

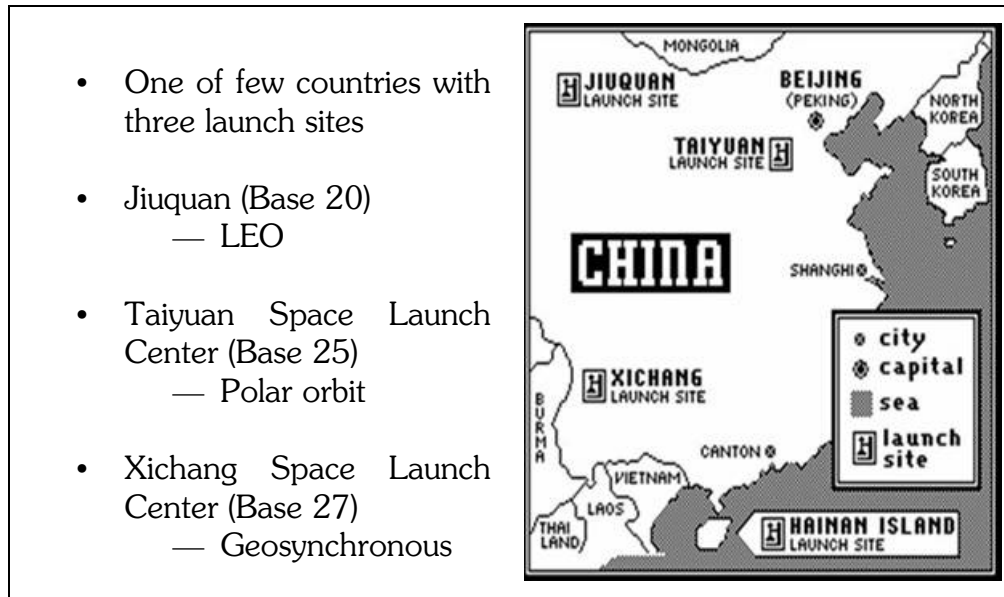
The Chinese space program itself is an outgrowth of the PRC's missile technology development effort and generally dates back to 1956 in the official record, this marking therefore their fiftieth anniversary. It was considered a priority program, alongside the missile and nuclear weapons development efforts, and has often been referred to as part of the *liang dan, yi xing* (two bombs, one satellite) effort. China's first satellite was orbited on April 24, 1970, which made China only the fifth country to launch its own satellite into orbit. Per Mao Zedong's instructions, the Dong Fang Hong 1 was both larger and more capable than the first American satellite, a point of pride to Chinese scientists. While the priority for space under Mao was national prestige and national security, those goals changed with the accession of Deng Xiaoping. Deng placed highest priority on economic and scientific efforts that would help develop China's economy and space had to take a back seat unless it could justify itself in those

terms. The creation of Project 863, however, in March 1986 moved space back into a foremost position, as aerospace technology was included alongside energy technology, information technology and biological sciences as keystones for future economic development in China. Subsequently aerospace projects have been highlighted in the eighth, ninth and tenth five-year plans.

So from this highly abbreviated history, we can see that the Chinese have consistently aspired to be a space power, even if their motivations have not always been the same as those of the U.S. and Russia. This naturally raises the question, what does it mean to be a space power? In simplest term, being a nation that is able to use space to achieve national goals. In order to use space, in turn, there are certain distinct elements that must be met. There needs to be high-level political support, which in turn allows them the allocation of sufficient funds and human resources. There needs to be national will to enter space, sufficient scientific and engineering manpower and economic resources. And then there needs to be a space infrastructure comprising launchers, satellites and a mission support capacity. So how does the PRC stack up when it comes to these elements?

In terms of national will, as I noted earlier, the Chinese space program has long enjoyed support from the highest levels of the Chinese government and that is still true today with the involvement of the highest levels of the state, the party and the military. Another aspect of space power is the resources devoted to it. The problem here, of course, is that the PRC does not publish reliable official figures about its space program and space spending. Estimates of Chinese spending, however, seem to make it comparable to Japan, which is said to have the world's second largest space budget, significantly outpacing Russia. Finally, to be a space power, a nation requires certain aspects of hardware: facilities, mission control centers, launchers and payloads. China meets all three requirements. In terms of launches, the primary Chinese launcher family is the *Chang Zheng* or Long March series of rockets. The Chinese field about fourteen of these, which provides them with the ability to orbit payloads from low-earth orbit all the way out to geosynchronous as well as polar.

In terms of launch sites and mission controls, the PRC has constructed multiple launch sites, giving them the ability to launch multiple rockets at the same time (Figure 1). The Chinese system is actually fairly specialized, with specific launch sites orbiting specific types of payloads. In addition to the three currently in service, there have been repeated reports that the Chinese are building a new spaceport on Hainan Island, probably in conjunction with their new family of launchers, which are scheduled to come out sometime over the next five to ten years. China's space missions are controlled and coordinated from near Xi'an. In support as well, they have signed agreements with a number of foreign nations, including Sweden, France, Brazil, Kenya and Pakistan to access information and tracking data from those nations. Interestingly, it established its first overseas bases, although they don't call them that, as part of the global network of TT&C facilities.



*Image from: Space Today*

Figure 1

China has developed five main types of satellite constellations. This doesn't include things like experimental and scientific payloads, supporting four main mission areas of communications, meteorology, remote sensing and navigation. In addition to these main satellite programs, the Chinese have also shown a great deal of interest in small satellites and have developed a dedicated launcher for them and they have engaged in a number of cooperative efforts, including the Galileo navigation satellite system with the Europeans.

One of the better metrics for judging Chinese space activity is according to five-year plans. During the 1990s, the PRC apparently launched no more than about ten satellites during either of the five-year plans encompassed therein. For the tenth five-year plan, however, from 2001-2005, China set out a goal to launch more than thirty-five satellites, or about three times what they had done previously, and succeeded in achieving that goal. Key goals laid out in the more recent PRC space white paper issued earlier this year (which is only the second such white paper) included developing a further series of satellites, expanding satellite manufacturing and launch capabilities, including the new Long March 5 series, which will be a heavy lifter, and becoming a global competitor in space industries, both in terms of launch and satellite services as well as ground equipment. In the ongoing eleventh five-year plan, the PRC has said that it intends to commence lunar research, its own program, developing the new rocket and pushing manned space flight. The latter will focus on promoting both short-term and longer duration missions, but let me note here, there is no discussion of a manned mission to the moon.

What are the military implications of this capability? According to Chinese military writings, there is a transformation underway in military affairs, something which

many of the folks here have also heard in reference to our own military planning. The Chinese base this conclusion on their observations of recent local wars, including Operation Desert Storm, NATO operations in the Balkans and our recent wars in Afghanistan and Iraq. They have concluded that the PLA's past approach to wars, which relied heavily on mass mobilization and preparation for all-out warfare, are frankly no longer appropriate. Instead the PLA has undertaken several fundamental reforms. Most relevant to today's discussion on space are the PLA's conclusions that 1) future wars will be joint, meaning multiple services, and 2) they will involve high technology and especially information technology. These were codified in 1999 regulations that were then promulgated throughout the PLA and have also been reflected somewhat in their training regimen. These regulations, their training regimen, and their discussions make it clear the PLA is preparing its forces to fight joint high-tech wars in the future.

What are the characteristics of these wars? Based on their observations, Chinese analyses have reached several conclusions. They will exhibit higher op tempo and they will occur across multiple battle spaces, not just land sea and air, but across electromagnetic spectra and in outer space. They will be non-linear, they will be long-range, they will be precision strike and they will involve high rates of expenditure of munitions, high casualty rates for the units of time but arguably lower casualties than, say, something like World War II. So future wars will be shorter, more destructive, but in some ways more decisive. A key element of future wars is what the Chinese term "informationalization," *xinxi hua*, which is an incredibly infelicitous translation and please accept my apologies for that. It is worth noting that the recent Chinese defense white paper of 2004 over and over again emphasized that informationalization, which is much more than the simple application of information technology, is a vital part of Chinese military modernization and extends throughout the entire gamut, logistics, planning, operations, tactical strategic operation. The idea is that not only information technology but the easy accessibility to information itself represents a qualitative shift in how wars are conducted.

The combination of joint operations and high technology, in turn, leads to an increased emphasis on space and space operations. The same information technologies and improved sensor systems that make modern weapons much more destructive effectively make outer space a key battleground. Thus, as I noted earlier, Chinese writings emphasize the issue of the "Five Battle Spaces," electromagnetic and outer space being the additions, the non-physical aspects, to the physical arenas of land, sea and air. When the Chinese talk about high technology, PLA authors note that they are discussing information technology, specifically information collection, transmission, management and analysis, space being a key arena for each of these functions. From the Chinese perspective, the United States is the leading practitioner of this kind of warfare and PLA writers regularly refer to the American conduct of operations in Kuwait, the Balkans, Afghanistan and Iraq as exemplary models. They also regularly cite the extensive reliance of U.S. forces on space-based assets and identify that as a key means by which we have conducted such operations.

What does this say about PLA thinking about space? Let me first note that ***we do not know*** whether there is currently a PLA doctrine for space operations. As with their defense expenditures, there is very little in the way of firm, official, open-source statements about what Chinese military doctrine pertaining to space is. We cannot even be sure if they have established a specific doctrine for space operations comparable to that for joint operations. But we can piece together from some of the ongoing debate, based on Chinese writings drawn from military textbooks, course materials and journals, some of the discussion that they are having among themselves on the issue of space. Within this discussion, it would appear that for the PLA, the aspirational objective of space operations is establishing space dominance, whereby it can both preserve friendly space systems and deny access to space, as much as possible, to an opponent.

Without control of space, at least at the local level, PLA authors suggest it is virtually impossible to gain or maintain air or naval dominance, which in turn then makes winning the war much more problematic. Loss of control of space, according to Chinese writings, would put the PLA in a primarily reactive stance. As one article notes, “The struggle to seize the strategic commanding height in future wars will be unfolded in outer space.” Another author notes, “In modern wars seizing space dominance has already become a vital part of seizing the information dominance, from which one can then retain the active position in war.” So the PLA’s thought process appears to be as follows: future wars will require the ability of disparate forces to interoperate jointly across vast physical expanses to exquisite precision and timing. To do so effectively, one must be able to obtain and exploit information, which in turn requires the ability to use space and deny it to an opponent. Space represents a new strategic high ground (*xin de zhi gao dian*) and is described as such.

Chinese authors note that the combination of modern information technology and military space systems is the backbone for coordinating land, sea and air forces and is crucial for coordinating operations. They write that whoever gains space dominance will be able to influence and control other battlefields and will likely retain the initiative and reduce an opponent to the reactive and passive stance. As one article which was highlighted in both *Jie Fang Jun Bao* (*People’s Liberation Army Daily*) and *Zhong-guo Guofang Bao* (*Chinese Defense News*) noted “information dominance cannot be separated from space dominance. We can say that seizing space dominance is the root for winning the informationalized war.” The aim, then, of potential future PLA operations would seem to be two-fold: exploit space themselves and deny it to an opponent.

At the same time, however, PLA writings also continue to focus on dual-use technologies. As a recent Chinese defense white paper noted, defense-related science technology and industry, including specifically space, need to facilitate the development of the national economy. Given that China remains a relatively poor and underdeveloped nation, the importance of building up comprehensive national power remains the over-arching priority. However it is also interesting to note that the key mission areas

that the Chinese have noted for space are areas of communication, meteorology, geodesy and navigation, all areas in which their current dual-use space capabilities provide them with the ability to conduct operations.

What then are the implications for the United States if the Chinese are, as I would suggest, a space power? The implications for the U.S., I would submit, depend on what ends we think that China is likely to pursue in space. One would seem to be to enhance its own prestige and by the very fact that it is a space power, China has already set itself apart from quite a few other nations and certainly almost all the other Asian states. Its space infrastructure, its array of launchers, its space industries, as well as the ability to put a man in space, place it above even that of Japan in terms of demonstrated space capabilities. This is no small feat for a nation that in 1949 was hardly viewed as a competitor with the United States and the Soviet Union. That China has done so much, and much of it on its own, through mostly indigenous development can only further contribute to the perception of China rising. Another end, linked to but distinct from prestige, is international access. China has adroitly used its space program as a diplomatic tool. The Chinese push behind the Asia-Pacific Space Cooperation Organization, for example, is clearly as much about making China appear the most accessible of the space powers as it is actually seeking to forge a joint space capability with Bangladesh and Mongolia.

Similarly it is worth noting that the Chinese have utilized their space efforts to develop closer links to the space capabilities of other nations. The most prominent noted is Brazil, but also France, and as I said earlier, China's first overseas facilities – again not bases – were in Swakopmund, Namibia and Kirabati in the South Pacific. More recently they have established access to facilities in Pakistan, a long-time Chinese ally but also Kenya, part of a larger, broader Chinese push into Africa. In this regard, space development also holds the possibility of cooperation with more technologically advanced powers, the whole business with Galileo, for example. In addition, of course, the PRC can also cooperate with less technologically advanced states, at least if they have something to offer. China is building a new satellite in cooperation with the Nigerians and is also engaged in talks with the Venezuelans to build a new satellite with Caracas. Neither prestige nor access to the international space business and space science communities necessarily carry significant implications for the United States, but it is also important to recognize that an independent space capability, such as China is now fielding, means that the PRC has access to certain types of information and capabilities that few other nations possess. China in this regard is not your typical less-developed nation. It has the ability to monitor its environs from the incomparable high ground of space. It has the ability to maintain situational awareness. And it has the ability, as part of an overall deterrent that extends into both the conventional and nuclear realm, basically to tell other people that it is not a nation to be trifled with.

Nor is this a capability that necessarily only benefits China. Information, as anyone who has ever received emails, or spam for that matter, can attest, is quite fun-

gible. Information from space-based sensors or based through space-based nodes can be provided to other states. China, with its steadily expanding array of space capabilities, effectively gains a significant diplomatic lever: the ability to complicate or to facilitate efforts to isolate one or another nation. Imagine, for example, how much more difficult planning for Operation Iraqi Freedom would have been if U.S. military planners could not be sure if China were providing Iraq with satellite photography. On the other hand, imagine how much more credible a given diplomatic initiative might be if Beijing were to provide independent confirmation that one or another option was or was not being put into place. The point of this is to suggest that if, as I believe, the Chinese are a true space power, they are a qualitatively different counterpart in this post-Cold War environment.

I began this talk by noting the prerequisites of being a space power, meaning the possession of political will, national resources and technological elements to exploit space. As my remarks hopefully have made clear, China, in my opinion, possesses all of these elements. So in closing, let me suggest that as the purportedly old Chinese saying goes, it would appear that in space at least we face the prospect of interesting times. Thank you very much.

**Larry Wortzel:** Good afternoon, thank you for being here. It is a pleasure to be part of this Marshall Institute event and to work with Dean. We have worked in parallel on some of these things for a number of years and I have great respect for the work he has done. I want to talk a little bit about the evolving doctrine in the strategic thinking of the People's Liberation Army as it approaches warfare, how the PLA views the United States' and Russian activities in the military realm and in space, and then I will discuss some of their actual operations or research areas on counter-satellite programs, jamming of reconnaissance, jamming of navigation and communication satellites and on blinding and how that fits into a warfighting doctrine.

First of all, let me start by saying that we really should not be surprised that professional officers of the People's Liberation Army (PLA) are thinking and writing about how to incorporate new technology into warfare or how technology will transform warfare. That is what militaries do. The PLA keeps a body of people, as we do at the Army War College (where I was on the faculty at our National Defense University at the Air War College and Marine Corps War College) and our staff colleges. Also, they have regular publications and journals and monographs where people get interested in issues and follow through with research and publications on these subjects. In China, the materials that Dean and I primarily exploit or pay attention to come out of the Academy of Military Science, their National Defense University, the Nanjing Command College, the Navy, the Second Artillery and the Air Force Command Colleges, some of the logistics institutions and some of the engineering colleges. They are not transparent in terms of policy and intentions, but you really can get a fair picture of future doctrine if you can either get someone to translate it for you or you read Chinese at that level.

What we need to be concerned about here in the United States, in my view, is that the People's Liberation Army seems to have taken the United States seriously as its main potential threat. They are not too worried about Russia; they are working well with Russia. They think that they have strategically deterred India and they are not too worried about Japan. But in their writings, officers of the People's Liberation Army see the United States as the country with the greatest capacity to coerce them or attack them. As I say in Table 1, we are the "Gold Standard" for modern warfare. Two factors tend to come together for the PLA: we are the gold standard in how to use technology in fighting a war and what they emulate in how to develop doctrine, and we are the big potential threat, primarily because of the potential for coercion.

**Approaches to Warfare**

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| <ul style="list-style-type: none"><li>• Five Domains<ul style="list-style-type: none"><li>○ Land</li><li>○ Sea (Undersea)</li><li>○ Air</li><li>○ Space</li><li>○ Electromagnetic Spectrum / Information</li></ul></li><li>• US as "Gold Standard"</li><li>• US as Threat</li><li>• C4ISR<ul style="list-style-type: none"><li>○ Info War</li><li>○ Integrated Operations</li></ul></li><li>• Strategic Missiles</li><li>• Sea Control / Sea Denial</li></ul> |
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Table 1

To illustrate these points, I want to read a quote from a major general, one of the department chiefs at the Academy of Military Science, that addresses how the PLA views the United States. This is an authoritative text I am reading from.

*The new military transformation has led to the rise of a United States possessed of overwhelmingly dominant military might. The United States is also an arrogant country with strong ambitions for hegemonism. The United States will take advantage of its absolute superiority and supreme military might in order to pursue power politics and hegemonism twice, seek to maintain its position as the world's only superpower and slow down the process of the multi-polarization of the world's strategic structure.*

Let me talk a minute about hegemonism. We are in the National Press Club and probably everybody here knows English. Hegemony is not a pejorative term in English; it is actually a fairly positive term. It indicates power and leadership on a given

issue. In Chinese it is *ba chuan* or *ba chuan zhuyi*. *Ba chuan*, hegemony or hegemonism is a negative term in Chinese – *ba* is an evil emperor, an evil leader who uses his power for his own gains. Hegemonism is the use of power for purposes that are negative, so it is not a neutral term in Chinese. When you see that word in Marxist-Leninist terminology and particularly in Chinese Marxist-Leninist terminology, it isn't a good thing; they don't think you are their buddy. That is important to keep in mind.

Let me just read the last phrase once more: *slow down the process of the multi-polarization of the world's strategic structure*. Now when I think about the term "strategic structure," I start thinking about ballistic missiles and nuclear weapons. So do they – this is not a statement that supports or helps to underpin America's non-proliferation strategy. For all the lip service the Chinese government gives to non-proliferation, this statement by a PLA general leads you back to the old Maoist doctrine that a superpower with a monopoly on nuclear weapons and missiles is a dangerous thing; they believe that nations need to proliferate these weapons to create a world with many centers of power.

Why should we be concerned about this? I started out saying that military people think about these things as a matter of natural course. We should be a little concerned about them because of the nature of the state in China. The defense leaders and politicians in China do not respond to popular vote. The chief of the general staff department of the PLA and the Defense Minister do not go in front of a freely elected legislature to explain and justify long-term defense goals. Nor do they justify their strategy or their budgets, or what they need in terms of equipment to meet that strategy, in front of a voting public or their elected representatives. In a nation where there are no independent court system, no free press, where all these decisions are made in secret by a single authoritarian political party, you have to be concerned about their intentions. The writings that we see on future warfare are fairly transparent, but the military intentions of the PLA or the Communist Party are not transparent. That is what Secretary of Defense Rumsfeld was asking in 2005 in Singapore: what is this military buildup for?

To a certain extent, as I said, the PLA as an institution is reacting to the introduction of new technology. Their new military doctrine is very clear that in an era of high technology, especially information technology, future warfare operations will depart from the surface of the earth. Their military writers recognize that national sovereignty extends into the atmosphere and even the exo-atmosphere, but they recognize that space, like the open seas, is a domain free for navigation and use for all mankind. Still, I think the Chinese government and military are engaged in a little bit of deception. At China's urging, some smaller nations have introduced a United Nations treaty banning the placement of any weapons in space. This would effectively preclude space-based missile defenses and limit the options for great space powers. Now it is countries and Bangladesh that are carrying the Chinese water at the UN on this. Such actions are an example of PLA legal warfare. Meanwhile, despite the announced posi-

tion in China eschewing weapons in space, I am going to talk to you about some very serious space warfare programs or counter-satellite programs that they have going on. The Chinese foreign ministry is using these tributary states – actually they are not tributary states, they are client states since China contributes to these states and really supports them – to run this treaty. The objective is to try to hamstring, tie up and limit what the United States and other powers can do in space while China moves forward with its own programs. For instance, *The Science of Military Strategy (Zhan Lue Xue)*, which has been translated into English, is out in its third edition and is a highly authoritative book. The authors are very clear that they expect space to become a battlefield in high-tech warfare and they will expand warfare into the sky and space.

In other writings, for instance from the Academy of Military Science journal *Junshi Kexue (Military Science)*, PLA writers argue that the atmosphere and space will be the primary battlefields in the future and the dividing line between them will be blurred and this will extend to whole communications networks and frequency spectra. A number of other articles very recently talk about using upper atmosphere aircraft that can fight up into space or down into the atmosphere and developing aircraft that can do this. These articles say a nation that is a modern military power ought to be able to use satellite reconnaissance and communications to support warfighting, to find ways to use space for offensive weapons, and they should have an anti-satellite capability that is ground-based, sea-based, air-based and space-based.

In talking about the domains or realms of warfare, Table 1 shows the concepts that you see routinely in PLA books and articles today. They are prepared to fight on land. They see the maritime domain of war as either sea or undersea. In the air, or course, they are prepared to fight, and PLA strategists see the extension of war into space as a natural thing. If the technology facilitates warfare in a particular domain, they want the capability to do it. Finally, they are prepared to fight in the electromagnetic spectrum or information spectrum. You will see that domain or war written both ways, but they recognize that that is a major area for warfare. Also, they are very clear; they use some of our terminology in ways that I have not seen in Chinese until recently, after the U.S. military began to use it. PLA strategists routinely talk about battle space and opine that battle space is expanding to include space and the electromagnetic spectrum.

I will turn now to some of the anti-satellite programs that they have written about. I am talking about things derived primarily from Chinese journals and sources. First, I want to credit the excellent research of Luke Armerding, who has done some wonderful preparatory research for me on a couple of recent papers I wrote. He has managed far better than I could do web searches and found some excellent material. From the *Journal of Electronic Information Warfare Technology*, a PLA-sponsored journal, we have learned that there is a program to develop laser blinding systems. You saw an example of that program if you read the newspaper three weeks ago. A Chinese ground-based laser actually blinded an American defense satellite and the De-

fense Intelligence Agency (DIA) publicly acknowledged that. The PLA has formal programs to jam navigation satellites. You will find discussions in PLA journals of how to effect such jamming by using broad-spectrum or narrow-frequency jamming. I will not discuss U.S. programs and systems, but synthetic aperture radars in space are pretty useful tools for military intelligence collection and warning; they would be the cutting edge of different types of either verification technology. Some PLA military journals have a series of articles that focus solely on jamming synthetic aperture radars in space. The PLA is pretty serious about this stuff.

An article in January 2001 that appeared in *Sing Bao*, a Hong Kong newspaper, cited a PLA source who spoke to a journalist, insisting on anonymity, about programs for parasitic satellites and programs to collide satellites with other satellites in space. The PLA source suggested that China could either attach and jam foreign satellites or just collide into them and knock something out of space. The Federation of American Scientists completely rejected this article in *Sing Bao* (and it appeared in a few places) because the source insisted on anonymity and the information couldn't be verified. I do not know why those folks over in FAS aren't reading some of the articles that Dean and I are reading, but there are credible articles in the *Journal of Astronomics* that address theoretical algorithms to maneuver bodies in space to shift to different orbits to achieve a rendezvous. I am not a rocket scientist, but to anyone who thinks about it, that sounds like making sure two things can meet each other in space, which includes colliding. Of course this capability does other things as well; obviously in a space program you would want that capacity. PLA officers at the Academy of Equipment and Command and Technology are creating a simulation laboratory to move exercise battle space into space to experiment with some of these things. The PLA also can use digitized mapping to support its planning and simulations. They do not yet have real-time reconnaissance or mapping satellites, but their capabilities are pretty good. The Chinese military today has a nationwide command and control system that I will talk a little more about in a minute. It is redundant and uses satellite communications, microwave, High Frequency radio, fiber optic, and plain old-fashioned telephone lines to network deployed military forces with frontal or military region headquarters and the general staff department headquarters in Beijing. That is called the *Qu Dian* or *Zhanqu Dianzi* system. Literally, this means the frontal or theater of war or electronic communication system. There are a few very good articles on these things published in British and Indian journals.

As Dean pointed out, you cannot function fully in space without a satellite architecture to support real-time communications and reconnaissance, and the PLA does not have a full architecture yet. At present, China is supported by only three *Bei Dou* navigation satellites. Eventually, they will have a total of about thirty of these. Right now, what the limited system will do is make sure that a warhead shot at the United States, if all other GPS systems go down, will get to the United States accurately. At present the limited *Bei Dou* system will support a global shot over the Pacific. When

the full 30-satellite position-finding array is in place, it will support global targeting and operations.



Figure 2

Figure 2 shows an old-fashioned cruise missile. It is in there as a placeholder to allow me to talk about the fact that there are only two countries in the world that have supersonic cruise missiles, at least one of which we know is nuclear-capable. These supersonic cruise missiles can now operate with data-link transmissions and update themselves en route; they also should be able to data-link and update what they are doing from a satellite or GPS. These two countries are China and Russian. The Russian have the Moskit, which they sold to the Chinese. Since then, in addition to those they bought, the Chinese have reverse engineered the Moskit and cloned it. That is a pretty dangerous capability. Which of our airborne laser systems or which of our ship-based laser systems will knock out a mach-3 or mach-4 cruise missile? Zero. No such thing in our inventory. We will have to work on this capability.

I want to spend a couple minutes talking about Figure 3. If you follow Chinese doctrine, the People's Liberation Army talks about the first and the second island chains. The first island chain runs from Japan to Taiwan, down around Hainan Island and the Paracel Islands, 300 to 500 miles out from the coast. It runs roughly along or beyond the exclusive economic zone and the continental shelf. Chinese naval doctrine since about 1984 mentions this island chain and sets a broad requirement to make the seas inside it a "sea-control" area for the PLA. The second island chain that PLA strategists talk about is about 2,000 kilometers out and runs down a line past the Philippines, down by Guam, and up toward Midway. The PLA wants to be able to control the seas in the area of their exclusive economic zone; the goal is to have an anti-access or sea-denial strategy out to about that 2,000 km range inside the second island chain.

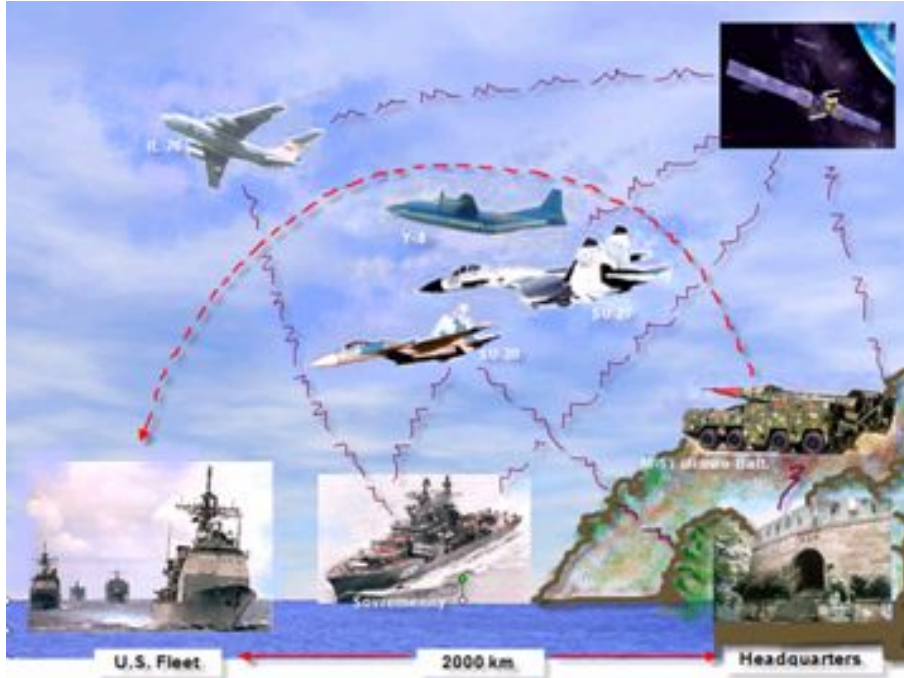


Figure 3

It turns out that not only the Russian Sovremenniy destroyers purchased by China, but all Chinese destroyers today, with the help of the Russians, the Italians or the Spanish, now have data links. If you deal with things like Link 11, Link 22 and Link 16 in the U.S. system, you know that these data-links will allow weapons and weapons platforms to exchange data for cooperative targeting or target identification beyond the horizon with AWACS aircraft and other platforms. With the new SU-30s and SU-27s China has bought from Russia, and with destroyer-based helicopters, the PLA can now link their weapons and platforms, not only with their helicopters, but also with aircraft and satellites. That data can be transmitted all the way back to a second artillery theater ballistic missile unit, to the general staff department headquarters or to second artillery headquarters. This is a very serious capability.

But what does the PLA lack? Today they don't have tracking and data relay satellites up there to support a global real-time surveillance capability. They do not have available a real-time communications intercept capability. Nor does the Chinese military have a global real-time military dedicated system for communications; they use a lot of the civilian systems to achieve the communications connectivity they need. They intend to put some of these satellites up. I think that within two to five years, they are going to have a system up will let them cover that 2,000 km area away from the coast in the second island chain. One of their goals is to be able to use satellite reconnaissance systems and tracking and data exchange to have a second artillery ballistic missile with a maneuvering reentry vehicle go after a deployed U.S. naval formation, a carrier battle group specifically, in their literature.

Now let me shift into some of the implications of all of this. Right now, the PLA can probably achieve a limited ability with a networked data exchange system using their AWACS aircraft at a range of about 1,500 to 2,000 miles out from their coast for a limited period of time, twenty-four to forty-eight hours. They actually just crashed one of their AWACS planes a few months ago. That loss limits their ability to maintain constant surveillance over an area. They cannot do it everywhere; they can't do it all over the Western Pacific, but they can focus a continuous surveillance capability off Taiwan or off Japan in a single area for an extended period of time. To further extend this capability and make it regional, they need a series of tracking and data exchange satellites, and they have not achieved that capability yet. I think they will launch such a system in two to five years. With respect to the goal the PLA has set of attacking a U.S. aircraft carrier battle group at sea, we don't know, from their writings, whether their war plans – believe it or not, we all have war plans – are for a conventional, a nuclear or a high-altitude electro-magnetic pulse burst. But the PLA sees the goal of attacking a deployed American carrier battle group as realistic and achievable. Think of the implications of that! The *Enterprise* docked in Norfolk just before Thanksgiving and there are 5,000 people on the *Enterprise* alone. The casualties at Pearl Harbor reached only 2,400. The World Trade Center wasn't much more than 2,400. Thus, when PLA officers routinely talk about being able to attack and sink an American aircraft carrier, they aren't thinking really hard about what comes back at them after that.

I would argue that one of the implications of what seems to be serious research and writing in China is that the United States ought to be engaged in equally serious defense talks with the senior PLA leaders on what the red lines are in warfare. The anti-satellite programs that I talked about affect our strategic warning. The Chinese need to understand that we are very sensitive about interference with our strategic warning and about the ability of the United States to gather indications of hostility. When another nation interferes with that capability, we tend to take that as an indication that the nation may want to attack us. If you have been in the strategic warning system awhile, you know that the United States talked to the Soviets about this at great length. We still talk to the Russians about it. Senior American defense and foreign policy leaders have not had this dialogue with the Chinese. The PLA won't even get serious about a dialogue with the Pacific commander about naval incidents at sea, to make sure that the next time a Song submarine broaches the surface, it doesn't do it under the Kitty Hawk carrier battle group and bump into it. The PLA has avoided such discussions despite repeated requests from the U.S., and we need to talk to them about these matters.

The implications here are that they the People's Liberation Army is close to achieving one of its major ten-year goals, if not twenty-year goals, of a reasonable anti-access strategy that at a minimum is going to impede or make more difficult American naval and air operations. Such a capability also would impede Japanese naval and air operations. The flip side of some of the PLA's work and achievements is that as the Chinese armed forces get more dependent on the electro-magnetic spectrum, satellites

and these types of military communications, they become more vulnerable, as vulnerable as we are. Again, that indicates to me that we should be seriously talking with the PLA about these matters. I have served two tours of duty as a military attaché in Beijing and have talked to some of their officers about it; I have been in meetings with several U.S. Secretaries of Defense and Undersecretaries of Defense who raised the need for these kinds of discussions with their Chinese counterparts. The Chinese response has generally been “We don’t want to get into the kind of talks that you used to have with the Soviets, because that recreates a Cold War scenario.”

But you can’t stick your head in the sand. We, the United States and China, have this little problem between us about Taiwan. The problem is more serious problems when PLA officers threaten Los Angeles. When China is putting together programs and experimenting to blind American satellites or knock out American communications and computer systems, we need to talk. It does not have to be like the Cold War. China is not the former Soviet Union; it is not in an ideological battle to counter the United States. However, it is certainly not an ally and it has some serious military programs that we need to think very hard about and be prepared to counter and certainly to best. Thank you.

### **Questions and answers.**

**Question:** I thought you did an excellent job in setting the stage for the potential concerns in space. Beyond the talks that you talked about and the possibility of engaging, what other possibilities exist in engaging them on military and industrial activities that support space?

**Wortzel:** I have written quite a bit about that for *Space News*. I think the sort of model that we should have is one that is open to cooperation and engagement when they are at a certain level; but what we should not do, in my view, is help them along. I think back to the Cox Commission report: we inadvertently or for whatever reason provided information to them that improves their military capabilities. I would say that when China is prepared to cooperate at a stage of a space program and we can insure that what we are doing does not further improve their military capabilities, we should be ready to let them in on a program. There are a lot of other areas like insuring that the hatches to spacecraft are interchangeable and can interlock, that we have mutually supporting survival systems for spacecraft, which I think we could do right now. There are forms of experimentation in space that we could go on with right now. But what we have to be careful of things like the 8-6-3 program, the Torch program, which is a program specifically to import dual-use technology with the idea of improving military capabilities while improving civilian capabilities. We should watch out for that.

**Cheng:** I think the 8-6-3 program to begin with is a number of different parts and pieces there. That is certainly one aspect that some folks have pointed to, though another aspect is promotion of broader science and technology capability within China,

which doesn't really disagree with the larger point that China is trying to make itself a more sophisticated country, technologically and economically speaking. The question that we need to confront is how that fits in, if it does at all, with our own interests, recognizing that within our system, we have quite a few various interests, such as corporations, national government, the change-over in the majority party, which may or may not lead to changes in policy. The other aspect here, and this goes through some of the things that Larry was saying earlier, is the issue of the larger competition. China views space as a forum for competition, not just military, although that is what we are here talking about today, but diplomatically and economically. It is a chess piece that plays a role in different games, one that I am not sure we are always playing. The Asia-Pacific Space Cooperation Organization is a means of currying political favors and building political relationships with states that at the end of the day may not appear to matter in space, but will matter in a General Assembly vote, perhaps, on imposing sanctions on some third party. They may well play a role in terms of getting a U.N. Security Council vote, not on the veto level but certainly among the various states that don't have vetoes, on perhaps the next civil rights issue in Sudan or some place like that. These are all aspects of the larger game. I think we need to recognize that space isn't just about space; space is about national prestige and national power, and putting it in that context when we look at what the Chinese are interested in obtaining from a Loral, a Hughes, a Boeing, an Airbus.

**Question:** You have talked about their capability of their cruise missiles. What is their range?

**Wortzel:** It is not real long range now. It is several hundred miles, so they are at a point where now they have beyond-visual-range capability with the AWACS type aircraft. Actually, the SU-30 is kind of a mini-AWACS that can link to four SU-27s and direct them against multiple targets beyond visual range. That is how I came up with 2,000 miles. The real range of all this stuff off the coast is about 1,500 km and you can add another 500 or 600 km beyond visual range because of the weapons systems. That is about where they are. They are really just about where they hoped to be in terms of an anti-access capability, but they can't do it globally yet. They cannot achieve this even around one of their own deployed battle groups globally because they don't have the satellite linkups. So they are in beyond visual range and the range of most of their missiles, which is 500-600 km.

**Question:** Are they capable of targeting our battle groups?

**Wortzel:** I think they are, and I think they are going to be very quickly capable of using that ballistic missile if they wanted to. I have a buddy who is an F-15 pilot and he says, "They'll never get near us," and the Navy guys say the same thing. Well, that Song submarine got twenty-one miles off an aircraft carrier. But I want to point out the way that they think about using missiles in warfare. They don't call the Second Artillery the Second Artillery for nothing. For them it is nothing but a way to mass fire

against a target. When the Chinese went after the Paracel islands, there were five United States destroyers there, manned by the South Vietnamese. The Chinese went in with dozens of PT boats with little cruise missiles like the one in Figure 2 and torpedoes. Think about the queuing theory. There are maybe a hundred people in this room. I guarantee you, if I have a revolver, some of you are going to get mighty hurt, but you are going to kick my butt and beat me to death with the revolver. So I am somewhat dismissive of the Navy people who say, "The PLA will never get near us." First of all, the Chinese submarine got near us. And I am somewhat dismissive of my good buddy the F-15 pilot because when I said, "Well Ed, there are two of you guys together and you have about thirty-two missiles?" He said, "Yeah, about that." I said, "Okay, suppose there are a hundred of those old Chinese fighters coming at you with eight missiles each." He said, "We are in big trouble." We are more capable than the PLA, but their capabilities in a very short time went from zero to reasonably good. Five years ago I dismissed this idea that the PLA would master over-the-horizon targeting and persistent area surveillance. Then when I got ready to write something about the "aspirational" C4ISR force in the Chinese military, I discovered that they had about achieved that capability. When you do the research and you look through Jane's and you see what they have and what they can do or when you talk to a Chinese ship captain and ask, "Can you data-link to that helicopter?" he says, "Oh yes, we data-link all that stuff." That is in five years. They have done pretty well.

**Question:** The British Foreign Ministry sponsored a conference recently in Beijing where I gave a paper. I hit the Chinese on the subject of the laser and I have to admit, they gave me a response I wasn't quite sure how to respond to, so I thought I would pass it over to the two of you. As I expected, they denied it, but they also cited that General Cartwright of StratCom had said that there was no diminution of our capability and that the United States didn't even consider it worthy of doing a demarche back to China. They said there was no loss of capability in the satellite and that it was consistent with normal laser range-finding. How do you gentlemen respond to their response on that?

**Wortzel:** Who are they kidding? I don't know what General Cartwright said. I can guarantee you that that the blinding was intentional and was something we should, and probably do, take very seriously. I don't think it was accidental. I can tell you that in other forms of attack, the Department of Defense has been able to track the specific computer penetrations back to organizations of the PLA. People are being very polite about the shutdown of an entire bureau of the Department of Commerce and the trashing of all of its computers from a virus that emanated from a server in China. The Commerce Department will be polite and say, "Well, it was a server in China." Nobody will say it was either the PLA or some other organization in China. I think our government agencies know exactly who did this and I don't believe a word of the Chinese government's denial. I was in Beijing during the Tiananmen massacre and still to this day I hear Chinese generals and politicians deny that anyone was killed on Tiananmen Square!

**Cheng:** I think that one of the unfortunate aspects for the United States is that unlike Britain, we have not produced folks who manage to make pithy and yet memorable comments such as “The job of a diplomat is to lie and to lie well.” That being said, like Larry I do not know what General Cartwright said specifically. We have quite a few lawyers and if one were to parse the phrase “there was no significant diminution in space capability” and run that through legal counsel at \$400 an hour and a reverse translator, I would be very curious to know what came out at the other end. That would be my observation in that regard. I will note, however, that the Chinese understand that space is a very useful diplomatic tool and one of the things that they have made a cornerstone of their official positions on space is to neither weaponize nor militarize space. That is something that hegemonist powers do, nations like us. So any idea that China, a classic non-hegemonic power, would engage in something that touched on militarizing space would put the point to the British diplomat’s observation that the diplomats were lying. Certain niceties, I suppose, must be preserved.

**Question:** Did the administration miss an opportunity to address the question of how the U.S. should respond to non-interference tests like this in the space policy?

**Wortzel:** Actually, I don’t think the administration or the military missed the opportunity. I am pretty confident that it was discussed and addressed in private diplomatic communications. And that is the way they should be discussed and addressed.

**Question:** With these anti-satellite technologies, are you concerned that they may be used in more than military operations, like some sort of economic interference as well?

**Cheng:** Any interference with American satellite capabilities by definition has economic implications. A few years ago, if I remember right, one of our communication satellites went out, not due to outside action; it just died. All of a sudden you couldn’t use your credit card in the western states, or perhaps it was just Colorado. But the point is that in some part of the United States, your plastic money stopped working. Now you can cross-link and get something back up fairly quickly if one satellite went off because it had a bad battery or solar panels or what have you. But two, three, four satellites? It is nearly Christmas and you can go online and track exactly where your Christmas packages are, courtesy of GPS. If you lose that, what other things start dropping off the economy? What does that mean if your factory is depending on a bunch of widgets – that’s a technical term – or black boxes or chips and they are not getting there because air traffic is screwed up because GPS isn’t functioning? Part of the issue here is that if it is somebody going after a satellite with an ASAT, that is in some ways easier to deal with, because one minute #16 is there and the next minute, it is a cloud of metallic dust. The problem is when somebody goes after it electronically or by jamming and maybe it is still there, maybe it is not. Maybe it was somebody doing something bad or maybe there was a lot of sunspot activity. The markets don’t like uncertainty and that is the sort of uncertainty that really starts the brokers calling each other and the Dow having a really bad day.

**Wortzel:** Let me talk for a minute about how Chinese strategic thinkers in general view what they call “comprehensive national power” or *zonghe guoli*. They take this from a Japanese political scientist who developed the concept. They see it as a combination of economic power, military power, diplomatic power or strength, political power, what they call ideological or cultural power, and science and technology (S&T) power. Like good scientific Marxists, they have actually worked out the algorithm to compute every country’s *zonghei guoli* or comprehensive national power. They are very serious about that and that is why Dean’s answer is right on the mark. If they can reduce the comprehensive national power of another country or a potential adversary, they don’t particularly care where they reduce it. They don’t have to do it militarily; they can do it economically. What bothers me about their formula (and we all have these little formulas about national interest and power) is when you get enough comprehensive national power, in the view of these Chinese strategists, the end of that algorithm equals *giang zhi li*, the power to compel or the strength to compel other countries. So again, we don’t see their intentions; they don’t go in front of their legislature and justify why they are doing things, but I get nervous when I see this as the end result of these capabilities.

**Question:** Are there any commercial aspects of Chinese efforts to gain space control and if so, do they have any strategic implications?

**Cheng:** For example, the Chinese are engaged in discussions about building a satellite for Nigeria. I think that has already been contracted. This will mark the first time that the Chinese have sold a complete satellite, lock, stock and solar panels, to a foreign country. That puts them into the global satellite market. Now I remember when the Japanese were going to produce satellites like Toyotas and we all were basically going to depend on the largesse of Mitsubishi and Matsushida for our satellite communications. Obviously that didn’t happen. But the Chinese, as Larry said, have come a long way in just five years. Put them in the global satellite competition market and it becomes very interesting where they could be five or ten years from now. That is one aspect. The other aspect here is the issue of International Traffic in Arms Regulations (ITAR). When we manufacture satellites or satellite components, there are obviously ITAR regulations which then influence who can obtain access to those technologies and also who can even launch them. Now the French, being French, have produced a non-ITAR satellite and have been marketing it specifically with the objective of expanding the French market, of being able to be launched by whoever wanted it. And the Chinese are a major satellite manufacturer. You can bet that by definition they will not be subject to ITAR, which means that potentially all of a sudden the next Serbia, Venezuela or Sudan could at a very low launch price have access to space. Of course, the whole marketing point of the *Chang Zheng* was low launch price. So yes, in a nutshell, there are economic implications and strategic ones.

**Question:** China has become a cottage industry for us in the last few years, especially the national security and space types, but it wasn’t always that way. For about ten

years after the end of the Cold War, we really didn't get any intelligence from China at all. How much of this apparent acceleration is indigenous and true about China and how much is it that we just weren't looking very hard before? Now we have started paying attention and say, "Oh, my God! They have done this, that and the other thing" but they may have had it all along.

**Cheng:** First of all, never badmouth cottage industries; I make my mortgage payments on that particular cottage industry. I was trained in political science, and that means that there is an obvious answer and a real answer, which is far more complex. I think it works out as follows: there are lots of things we haven't been looking for and haven't looked at. Not only was it that it was the end of the Cold War "with peace and prosperity for all," but also there was the aspect that the Chinese were in many ways our political partner. They had been anti-Soviet and therefore in the wake of the Cold War, is it really important to focus on China? Are they the threat? Yes, there are lots of things that slipped under the radar and the radar just wasn't that low. That being said, on the issue of space and the military implications of space, I would submit that this is fairly new. It is fairly new for a couple of reasons. Nobody had really used space as a strategic military factor prior to the end of the Cold War. If you look at Viet Nam, for example, you had satellites and space-based communications systems, but the guys with the PRC-77s were not uplinking and downlinking and data-linking and all the rest. This is a function of the Gulf War, of Kosovo, of Afghanistan.

Another part is that in many ways, this is 1906 all over again. I choose that date very deliberately. In 1906, Lord Jackie Fisher builds the HMS Dreadnought and in one stroke, every battleship on the planet was obsolete, including the Royal Navy's. By resetting the clock, Britain had a slight jump in terms of the technology that was supposed to win the next war; we all know how well that turned out. But it also meant that Britain was in some ways at a disadvantage. Our use of space technology in the last several wars was in many ways unavoidable. It allowed us to defeat Iraq in 100 hours, it allowed us to topple the government in Kabul. But what it said to the Chinese is that this is an area that no one else has a huge, insurmountable advantage in, and, as I like to think our presentations today basically suggest, a venue where they can compete and compete well.

**Wortzel:** Let me respond to you as somebody in the intelligence business who, since 1970, has focused not exclusively but very heavily on China. The level of attention sort of waxed and waned, as Viet Nam reduced some kinds of attention on China. Certainly we were working very closely with the Chinese against the Soviets in Afghanistan and we still focused on their programs. But I think there has been this huge leap in science and technological capability in China and all of it occurred at a time when the United States was pretty heavily engaged in the Persian Gulf or in the Balkans, and a lot of our intelligence assets got diverted. So we were surprised. I think the United States Navy was highly surprised when two new classes of submarines came out in China during the past year, and they didn't think they were coming for five to six

more years. I think we were very surprised at how quickly they are moving along with some of these radar-jamming capabilities. But the PLA is very good at that. It is not because there was a complete lack of attention. It is not the former Soviet Union; it is not the same kind of threat to the United States. Nonetheless, we have some pretty sharp differences on areas of national interests. That said, we are not locked in an ideological struggle with China to kill each other off. Thus, we haven't focused the same sorts of assets on them, ever, that we did on the Soviet Union. That is probably appropriate.

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