

### 3.1 Terminology

Before exploring the motivations behind the Chinese ASAT test, it is important to first define the basic terminology seen in any discussion of military space. It is also necessary to discuss China's historical development of military space. With that foundation in place, one can then more clearly understand the nature of China's space program. Therefore the purpose of this chapter will be to introduce key terms and then apply them to a discussion of China's own space program, which, while often presented as benign by the PRC government, is highly militarized and appears to be edging towards the weaponization of space.

To begin, it is often difficult to agree upon the precise definitions of even basic space-related terminology, and this lack of consensus has historically handicapped both the public and the U.S. military establishment's attempts at resolving key debates and developing a clear conceptualization of outer space. This problem is highlighted by the struggle the U.S. Air Force has had throughout most of its history to establish a generally agreed upon definition of the terms *air*, *space* and *aerospace*.<sup>120</sup> In order to help clarify some of this confusion, which has been created by bureaucratic in-fighting more than anything else, let us first consider the point at which *space* begins. The lowest boundary of

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<sup>120</sup> Lambeth, viii-5.

near-earth space is defined as 93 miles above the earth because this is the lowest perigee of orbital vehicles. Below that, space vehicles in either circular or elliptical rotations cannot maintain orbit, and begin to fall to earth. Functionally speaking, all essentially agree that if it is orbit, it is in space.<sup>121</sup> Therefore, *space* begins 93 miles above the earth's surface and stretches out into infinity. The term *air* is more difficult to precisely define. For biological reasons a pressure suit is required for flight above 9 miles, however, that does not necessarily mean the air medium ends at 9 miles above the surface of the earth. Air-breathing engines are able to provide propulsion up to 28 miles above the earth, and so the functional limits of the *air* end at the 28 mile mark. Therefore a 65 mile operational "no man's land" effectively separates the air and space mediums. However, since the atmosphere trails off so gradually, and NASA awards U.S. astronaut wings at 50 miles for administrative purposes,<sup>122</sup> there has understandably been some confusion and debate over the matter that is likely to persist. In terms of *aerospace*, the U.S. Air Force now rejects the term altogether, in recognition of the fact that the air and space mediums are distinct, and that the ill-defined term *aerospace* existed primarily to protect the Air Force's institutional claim to both air and space operations and not to describe an actual operational realm.<sup>123</sup>

There has been even more discord over clarifying issues related to

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<sup>121</sup> M.V. Smith, *Ten Propositions Regarding Spacepower* (Maxwell AFB, Alabama: Air University Press, 2002), 4.

<sup>122</sup> *Ibid.*

<sup>123</sup> Lambeth, 5.

the *militarization* of space and the *weaponization* of space. Some have argued that near-earth space has been militarized since the German V-2 ballistic missile flights of World War Two and the U.S. and Soviet development of ICBMs in the early stages of the cold war. Conversely, others point out that because ballistic missiles only transit the space medium the way ancient cannonballs transited the air medium, one can no more argue that ballistic missiles militarized space than one can argue that cannonballs represented the advent of aerial warfare.<sup>124</sup> In any event, space was much more certainly militarized in the 1960s when both superpowers deployed satellite reconnaissance platforms into near-earth space. Since that time the number and variety of satellites performing military-related missions has drastically increased but, despite the early cold war development, testing and deployment of ASATs by the U.S. and the later deployment of operational ASATs by the former Soviet Union and China, space has not yet been *weaponized* because no nation has crossed the threshold of placing space-to-space or space-to-earth weapons in orbit for either a long-term or permanent basis.<sup>125</sup> However, the grey area between the militarization and the weaponization of space is ever darkening as China's broad and rapidly expanding military space and counter-space programs continue to push towards the potential weaponization of space.

The technology and capabilities for space warfare exist today, and while no weapons are currently deployed in orbital space, China's actions

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<sup>124</sup> Watts, Barry D. *The Military Use of Space: A Diagnostic Assessment* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2001), 98.

<sup>125</sup> Ibid.

are leading it and the United States down the slippery slope towards space weaponization. Several activities the PRC is engaging in could lead to an environment in which the deployment and use of weapons in space could be seen as the natural and logical next step.<sup>126</sup> These activities, some of which have already been mentioned and will be explored later in the chapter in greater detail, are better understood when one considers the historical development of China's space effort.

### **3.2 China's Military Space History**

China's space program has been from its very inception, and remains today, a fundamentally military endeavor.<sup>127</sup> The PRC government first began to consider developing its own space program in the wake of the former Soviet Union's October 4, 1957 *Sputnik* satellite launch, and funded the establishment of three new institutes for satellite research and development in early 1958.<sup>128</sup> The Sino-Soviet split in 1960 slowed the development effort, but returning Chinese students and experts trained in the United States picked up the slack and became absolutely critical to the research and development of China's missile and satellite technology.<sup>129</sup> The PRC space program was militarized from its very inception in 1958

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<sup>126</sup> Ibid., 105-106.

<sup>127</sup> Kevin Pollpeter, *Building for the Future: China's Progress in Space Technology During the Tenth 5-Year Plan And The U.S. Response* (Carlisle, PA: Strategic Studies Institute, 2008), 3.

<sup>128</sup> Xiaobing Li, *A History of the Modern Chinese Army* (Lexington: University of Kentucky Press, 2007), 155.

<sup>129</sup> Ibid., 162.

as the majority of space and missile-related civilian researchers were transferred into military service under the auspices of the Commission on Science, Technology, and Industry for National Defense (COSTIND), a highly centralized military authority in charge of the defense industry and weapons development. This trend continued throughout the 1960s and 1970s as thousands of Chinese scientists and researchers became active servicemen to avoid Mao Zedong's brutal, frequent political campaigns against intellectuals. In fact, it was the militarization of China's space program that allowed it to launch its first satellite in 1970 and survive the ten-year Great Cultural Revolution (1966-1976), which decimated most of China's cultural and intellectual capital.<sup>130</sup>

Since that time the PRC has made great progress across a wide range of space technologies. China's first manned space mission in 2003, as well as its second manned mission in 2005 and its successful lunar probe mission in 2007, have raised concerns about the U.S. ability to maintain the lead in space technology.<sup>131</sup> China has established a robust remote sensing satellite network, a satellite-based navigation and positioning system, and has developed a solid-fuel launcher for small and micro-satellites. It has also begun exporting satellites and taken a lead in regional space cooperation. China has ascended a long way from a low base to become a rising major space power.<sup>132</sup> During the period covered by its tenth five-year plan, 2001-2005, China launched 28 satellites and spacecraft on 26 launchers, achieving a 100 percent success

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<sup>130</sup> Ibid., 168-169.

<sup>131</sup> Pollpeter, 2008, 1.

<sup>132</sup> Ibid.

rate for non-test launches.<sup>133</sup> China's development of a robust space program serves the dual purposes of increasing China's influence in foreign policy and strengthening the communist party's claim to be the only organization fit to increase the material wealth of the Chinese people and restore the PRC to its rightful place in world affairs.

However, the Chinese space program still lacks the bureaucratic structures necessary to make it a civilian organization like NASA in both focus and culture. In fact, China's space program is still highly militarized, with the PLA developing and operating its satellites as well as its launch sites and operations center infrastructure.<sup>134</sup> It is this inherently military nature of China's space program, combined with its opaque nature and tendency towards disinformation that we now turn to.



Figure 8: Shenzhou 6 Taikonauts Nie Haisheng and Fei Junlong October 2005

Source: [www.aerospaceguide.net](http://www.aerospaceguide.net)

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<sup>133</sup> Ibid., 5.

<sup>134</sup> Ibid., 45.

### 3.3 China's Space Duplicity

The clear duplicity China demonstrates when discussing its space program not only precludes most forms of international cooperation, but is also leading to a deepening security dilemma between the U.S. and China. Studies of written and verbal statements made by PRC leaders and academics illustrate this point well. In an article written in 2006 by prominent Chinese space expert, PLA Major General Chang Xianqi, he argued that, despite international concerns “the peaceful purpose of the Chinese government’s space exploration is beyond doubt.”<sup>135</sup> He went on to insinuate that the U.S. was likely to deploy space weapons long before China stating: “China opposes an arms race in any form. This position is evident in its consistent and strong support for the non-weaponization of space...if the United States ultimately chooses to deploy weapons in space, it will be profoundly regrettable; however, it will have no impact on China’s space program...China will persist in taking the road of peaceful development.”<sup>136</sup> Chang then referred to charges China was developing micro-satellites as space weapons, stating: “China does not have any plan to use micro-satellites as anti-satellite weapons. The development and application of micro-satellites is for peaceful purposes only.”<sup>137</sup> He concluded his statement by saying, “it seems incomprehensible that China should cause concern to others”

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<sup>135</sup> Chang Xianqi and Sui Junqin, “Active Exploration and Peaceful Use of Outer Space,” *China Security* (Summer 2006): 16.

<sup>136</sup> *Ibid.*, 18-20.

<sup>137</sup> *Ibid.*, 20.

because “China is among the most avid supporters of the peaceful application of outer space.”<sup>138</sup> Yet, three years earlier, in an internal military publication the same author pushed human spaceflight technology, arguing that it “can carry a large amount of effective military payload” and can be employed as either a weapon or as a weapons platform.<sup>139</sup>

A Chinese academic, Zhang Hui, likewise argued that although “the United States does have legitimate concerns” because so much of its economic and military power resides in the “soft underbelly” of space, the U.S. did not currently face “credible threats from states,” like China, “that might expose those vulnerabilities.”<sup>140</sup> The Chinese Ambassador for Disarmament Affairs, Hu Xiaodi, while noting that “ASATs would be an effective way for China to counter the U.S. missile defense threat,” stated that “resorting to force and the development of space weapons will only be counter-productive.”<sup>141</sup>

These statements, when viewed in tandem with the facts of China’s ASAT testing and its counter-space program (which was well under development at the time of their production) reveal a duality that runs deep within the Chinese political-military establishment. Also revealing is that in 2002, China and Russia, along with Belarus, Syria, Zimbabwe, Indonesia and Vietnam, tabled a working paper at the U.N. that called for an outer space treaty, which specifically called for not resorting “to the

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<sup>138</sup> Ibid., 21-22.

<sup>139</sup> Pollpeter, 2008, 46.

<sup>140</sup> Zhang Hui, “Space Weaponization and Space Security: A Chinese Perspective,” *China Security* (Summer 2006): 25.

<sup>141</sup> Ibid., 28.

threat or use of force against outer space objects.”<sup>142</sup> China continued to broach the subject on a yearly basis at the U.N., even going so far as to say that Beijing would not cooperate on U.S. proposals to curtail ballistic missile technology proliferation unless Washington would sign China’s space treaty. However, because the Chinese definition of “space objects” included ICBMs (inter-continental ballistic missiles) traveling through outer space,<sup>143</sup> Washington had no choice but to refuse, lest it cede it’s right to shoot down ICBMs targeting American or allied cities. Thus on January 11, 2007 the PRC not only broke its stated policy that “China has every interest to avoid triggering a confrontation in outer space and it will never be a deliberate choice for China,”<sup>144</sup> the PRC also broke one of the most basic obligations of the space treaty it had vocally helped table and defend for years.

However, as the Chang Xianqi case indicates, the Chinese have been emphasizing the use of deception in their discussions of their own program. Colonel Jia Junming, in the 2005 book *On Space Operations*, urges: “Our future space weapons program should be low profile and intense internally but relaxed in external appearance to maintain our good international image and position.”<sup>145</sup> This “Janus-faced” policy on China’s part, whereby Beijing sought to use disinformation and its diplomatic influence to limit the U.S.’s ability to defend itself in outer

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<sup>142</sup> Hu Xiaodi, “Statement by Ambassador Hu Xiaodi on Outer Space,” *The Nuclear Peace Foundation*, October 19, 2004. available online at:

<http://www.nuclearfiles.org/menu/key-issues/space-weapons/issues/hu-xiaodi-UNGA-59.html>

<sup>143</sup> Zhang Hui, 25.

<sup>144</sup> Bao Shixiu, “Deterrence Revisited: Outer Space,” *China Security* (Winter 2007): 10.

<sup>145</sup> Cited in Michael Pillsbury. *U.S.-China Economic and Security Commission*, January 19, 2007.

space while simultaneously expanding its own future weaponization of space, may have been paying off. A U.S. Army War College professor wrote in his book *Defending Space*, that while “Chinese military space capability is growing...commercial demand may outstrip current and future systems” because the “PRC has turned” (away from its military space programs) “towards the exploding market for cell phones, weather...and other non-military applications.”<sup>146</sup> Before the events of January 11, 2007 were revealed, the idea that China was moving away from the military side of its space program in favor of the commercial was quite common, even in some U.S. military circles. Many were even arguing that the U.S. ought to cooperate more closely with the PRC in the commercial space business, hinting that risking the loss of certain national security technologies might be worth it to avoid losing America’s position of commercial space leadership.<sup>147</sup> This underscores just how effective the PRC government was at using disinformation to cover up its counter-space weapons program. This point should become even clearer as the facts of China’s counter-space weapons buildup are discussed.

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<sup>146</sup> Clayton K.S. Chun, *Defending Space: U.S. Anti-Satellite Warfare and Space Weaponry* (Oxford: Osprey Publishing, 2006), 53.

<sup>147</sup> John Baker and Kevin Pollpeter, “A Future for U.S.-China Space Cooperation?” *Space News*, December 13, 2004.

	Communications	Early warning and nuclear detection	Intelligence, surveillance and reconnaissance	Meteorology	Navigation and guidance	Remote sensing
<b>Representative US space systems</b>	Defense Satellite Communications System (DSCS) [GEO]	Defense Support Program (DSP) [GEO]	Electro-Optical Imaging Satellites [LEO]	Defense Meteorological Satellite Program (DMSP) [LEO]	NAVSTAR Global Positioning System (GPS) [MEO]	LANDSAT [LEO]
<b>[orbits]</b>	Air Force Satellite Communications (AFSATCOM) and Fleet Satellite Communications (FLTSATCOM) [GEO]	Space-Based Infrared System-High (SBIRS-H) [GEO/HEO]	Infrared Imaging Satellites [LEO]	Geostationary Operational Environmental Satellite (GOES) [GEO]		
	Military Strategic Relay Satellite System (MILSTAR) [GEO]	Space-Based Infrared System-Low (SBIRS-L) [LEO]	Synthetic Aperture Radar Imaging Satellites [LEO]			
			Signals Intelligence Satellites [GEO]			
<b>Feasible Chinese attack options in the near and medium term</b>	Electronic attack	Direct ascent attack [LEO]	Direct ascent attack [LEO]	Direct ascent attack [LEO]	Electronic attack	Direct ascent attack
	Ground attack	Ground attack	Directed energy weapons [LEO]	Ground attack	Ground attack	Ground attack
			Ground attack			Directed energy weapons
<b>Feasible Chinese attack options in the long term</b>	Direct ascent attack	Direct ascent attack	Direct ascent attack [GEO]	Direct ascent attack	Direct ascent attack	Co-orbital attack
	Co-orbital attack	Co-orbital attack	Co-orbital attack	Co-orbital attack	Co-orbital attack	
	Directed energy weapons	Directed energy weapons		Directed energy weapons	Directed energy weapons	

Table 1: U.S. Space systems and Chinese ASAT attack options

Source: [www.informaworld.com](http://www.informaworld.com)

### 3.4 China’s Counter-Space Weapons Development

The revelation that China shot down its own FY-1C satellite in a “hit-to-kill” intercept last year not only underscores the tactical prowess and technological sophistication behind the PLA’s space warfare program, it also testifies to the priority the PRC’s leadership has accorded to the program for a number of years. On the technological front, Ashley Tellis says, “This technology – ‘intercepting a bullet with a bullet’ – demonstrates that China has surpassed the erstwhile Soviet Union, which in its heyday could do little beyond attempting to kill its targets by spraying them with shrapnel from a conventional fragmenting

warhead.”<sup>148</sup> According to the Secretary of the U.S. Air Force, General Wynne, the Chinese test was a “strategic surprise” that represented a continuing Chinese ability to “outpace our estimates.”<sup>149</sup> But in fact, some in U.S. security circles had been warning about China’s growing military space systems for years.

A 2002 article by the Center for Nonproliferation Studies notes: “PLA writings suggest that given heavy U.S. reliance on satellites and other space assets for military operations, jamming and destroying these space assets will become increasingly important in a future conflict. ASAT systems...are potentially powerful weapons against a technologically dominant adversary.”<sup>150</sup> Philip Saunders, a senior research professor at the National Defense University in Washington, D.C., also pointed out in 2005 that China’s “space program is...notable for the movement of personnel and technology between the civilian and military sectors,” and that as Chinese space capabilities improve, they will produce “significant boosts in People’s Liberation Army (PLA) military capabilities.” He also pointed out that the PRC government was developing high-resolution space reconnaissance satellites to provide near-real time imagery, and exploring the use of GPS signals to improve ballistic and cruise missile accuracy, while also advancing its own Beidou satellite navigation system. His article also reported Beijing’s “efforts to develop high-powered lasers and mobile small-satellite launch

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<sup>148</sup> Tellis, 42.

<sup>149</sup> Anderson, 19.

<sup>150</sup> Phillip Saunders et al., “China’s Space Capabilities and the Strategic Logic of Anti-Satellite Weapons,” *Center for Nonproliferation Studies*, July 22, 2002.

capabilities” as well as efforts aimed at “developing micro-satellites or direct-ascent weapons for ASAT purposes.”<sup>151</sup>

The Pentagon first publicly disclosed that China was developing a direct-ascent ASAT system in its annual report on Chinese military power in 2003. This report also pointed out that this type of ASAT weapon system was only one part of a larger spectrum of offensive capabilities aimed at vitiating U.S. dominance of Space.<sup>152</sup> It was not long before the Department of Defense (DoD) report was proven correct. Starting in September 2004, the PLA began a series of three direct ascent ASAT tests, which led up to the fourth, this time successful, test that destroyed FY-1C.<sup>153</sup> At the same time, the PRC was devoting significant resources to directed-energy systems, particularly ground based lasers, with which, as previously noted, they began to “paint” U.S. spy satellites. According to one report, the “Chinese routinely turn powerful lasers skywards, demonstrating their potential to dazzle or permanently blind spy satellites.” The report went on to quote Gary Payton, a senior Pentagon official who said “They let us see their lasers. It is as if they are trying to intimidate us.”<sup>154</sup>

The Chinese have also been developing (and in some cases fielding) cyber warfare units to hack into space control systems; co-orbital, anti-satellite “mines” to covertly destroy enemy satellites; radiofrequency

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<sup>151</sup> Phillip C. Saunders, “China’s Future in Space: Implications for U.S. Security,” *Space.com*, September 20, 2005. available online at:

[http://www.space.com/adastra/china\\_implications\\_0505.html](http://www.space.com/adastra/china_implications_0505.html)

<sup>152</sup> OSD, 2003, 36.

<sup>153</sup> Tellis, 43.

<sup>154</sup> *The Economist*, 26.

weapons to jam satellite signals; and high-powered microwave weapons to destroy satellites from earth. Some of these systems have been in development for over a decade, and the cyber warfare and laser programs are particularly mature.<sup>155</sup> According to the Senate subcommittee report of General Cartwright, then commander of U.S. strategic forces, the Pentagon was especially concerned with China's mini-satellite weapons platforms and the possibility that China will introduce weapons of mass destruction into space. One of the chairmen of the subcommittee after Cartwright's briefing said that China is expected to have enough ASAT weapons by 2010 to "basically knock out most of our satellites in low-earth orbit."<sup>156</sup> The veracity of this statement and all that it portends will be tested in Chapter five when we discuss the implications of China's counter-space developments.

In summation then, China's successful ASAT test and its development of counter-space weapons, which were discussed in this chapter, were clearly not part of an isolated PLA cover-up or bureaucratic miscommunication, as was suggested by some, but rather representative of a well-entrenched, well-funded effort on the part of the Chinese government to negate the space power of the U.S. Having established a clear set of relevant vocabulary, a better understanding of China's highly militarized space/counter-space program and China's propensity towards disinformation when discussing its program, we will now discuss the various motivations driving China's counter-space program and attempt

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<sup>155</sup> Tellis, 54-55.

<sup>156</sup> Bill Gertz, "China has Gained and Tested Array of Space Weapons," *The Washington Times*, March 30, 2007, 1.

to answer the question of why the PRC performed its direct-ascent ASAT test of January 2007.



Figure 9: Optical Range Lasers

Source: [www.defensetech.org](http://www.defensetech.org)



Figure 10: Chinese Lunar Probe

Source: [www.pbs.org](http://www.pbs.org)