



# BRITISH AMERICAN SECURITY INFORMATION COUNCIL

## BASIC NOTES

### OCCASIONAL PAPERS ON INTERNATIONAL SECURITY POLICY

16 March 2007

# The Newest Anti-Satellite Contender: China's ASAT Test

By David Isenberg  
BASIC Senior Analyst

## Key Points:

- China joins the United States and Russia as one of only three countries to have successfully tested anti-satellite (ASAT) weapons.
- China now has the potential capability to destroy some U.S. spy and missile defense satellites, although most U.S. communications and targeting satellites are at a higher altitude and remain out of reach.
- Russian military, intelligence and communication satellites are more vulnerable, however, since many are in low Earth orbit.
- The test is expected to double the density of space debris larger than 1 cm at altitudes near 850 km for at least five years – putting at risk even the Chinese satellite program, which is carrying out about 10 launches each year.
- The test makes it more difficult for the U.S. to ignore China's potential as a peer competitor in space and may have strengthened the hand of U.S. hawks opposed to a treaty banning the deployment of weapons in space.
- Some common sense 'rules of the road' for space-faring nations are needed alongside a revitalization of the Prevention of an Arms Race in Outer Space (PAROS) negotiations.

## Introduction

On January 11, 2007, China successfully carried out its first test of an anti-satellite weapon.<sup>1</sup> The launch was detected by the United States early that evening. According to *Aviation Week and Space Technology*, the test appeared to employ a ground-based interceptor missile, launched from a base in remote western China, which used the sheer force of impact rather than an exploding warhead to shatter the target satellite.<sup>2</sup> The Chinese test was the first time that a ground-based missile has been launched successfully to destroy an orbiting satellite.

Thus China entered a very exclusive club, as only two nations, the former Soviet Union and the United States, have previously damaged or destroyed spacecraft in anti-satellite tests, most recently the United States in the mid-1980s.<sup>3</sup> None of the Soviet tests resulted in a target's complete destruction.<sup>4</sup>

From an arms control perspective the Chinese test demonstrates both China's ability to counter potential U.S. "defensive" space technologies with asymmetric counteractions, and the need to develop some common sense rules of the road for space-faring nations.

The test also illustrates the need to revitalize the longstanding Prevention of an Arms Race in Outer Space (PAROS) negotiations in the United Nations' Conference on Disarmament (CD).<sup>5</sup> Otherwise the deployment of space weapons could destroy strategic balance and stability, undermine international and national security, and disrupt existing arms control instruments.

Restarting the negotiations will not be easy. The U.S. view is that there is no place in the talks for arms control. Last June the U.S. delegation to the PAROS negotiations at the CD said:

*Our delegation is more convinced than ever that issues relating to the supposed weaponization of space definitely do NOT command consensus in this body...*

*...the United States does not have any weapons in space, nor do we have any plans to build such weapons. On the other hand, the high value of space systems long has led the United States to study the potential of space-related weapons to protect our satellites from potential future attacks. As long as the potential for such attacks remains, our Government will continue to consider the possible role that space-related weapons may play in protecting our assets....*

*The cold war is over, and there is no arms race in outer space. Thus, there is no - repeat, no- problem in outer space for arms control to solve.<sup>6</sup>*

### **The Chinese Test: Implications for U.S. Missile Defense and Space Policy**

The Chinese test was similar to the U.S. test of a kinetic energy ASAT weapon that destroyed a U.S. scientific satellite in September 1985, the last time such a test was conducted by any country. The U.S. test took place at an altitude of 525 kilometers.<sup>7</sup> In that test, a U.S. Air Force F-15 launched a miniature kill vehicle propelled by solid rocket motors to impact and destroy the USAF Solwind science spacecraft. Previously, the U.S. military had used an air-launched missile to destroy a satellite and the former Soviet Union downed a satellite with a launch from Earth orbit. But earlier U.S. attempts to shoot down a satellite from ground-based missiles failed.

The weather satellite hit by the Chinese weapon was orbiting at an altitude of roughly 805 kilometers (500 miles). Other satellites positioned at the same altitude are part of the missile defense network that the U.S. military is assembling. Theoretically, the test means that China can now also hit other American spy satellites that orbit closer to Earth. Such satellites include most of the imagery satellites used for basic military reconnaissance.

In August 2006, President Bush authorized a new national space policy, the first in nearly ten years, which ignored calls for a global prohibition on ASAT tests. Among its principles the policy said:

*The United States considers space capabilities -- including the ground and space segments and supporting links -- vital to its national interests. Consistent with this policy, the United States will: preserve its rights, capabilities, and freedom of action in space; dissuade or deter others from either impeding those rights or developing capabilities intended to do so; take those actions necessary to protect its space capabilities; respond to interference; and deny, if necessary, adversaries the use of space capabilities hostile to U.S. national interests,<sup>8</sup>*

In fact, the U.S. has been pursuing policies to control and dominate space for many years. The U.S. Space Command *Joint Vision 2020* of June 2000 says:

*Robust capabilities to ensure space superiority must be developed just as they have been for land, sea, and air.*

And according to the Air Force Space Command Strategic Master Plan for FY 06 and beyond:

*A viable, prompt global strike capability, whether nuclear or non-nuclear, will allow the U.S. to rapidly and accurately strike distant high-payoff, difficult-to-defeat targets. This capability provides the U.S. with the flexibility to employ innovative strategies to counter adversary anti-access and area denial strategies. Such a capability will provide warfighting commanders the ability to rapidly deny, delay, deceive, disrupt, destroy, exploit, and neutralize targets in hours/minutes, even when U.S. and allied forces have a limited forward presence.*<sup>9</sup>

## Space Debris

The target of the Chinese ASAT test was a defunct Chinese weather satellite known as Feng Yun 1-C. Launched in 1999, the third in a series, it was a cube measuring 4.6 feet on each side with solar panels extending about 28 feet. It was due for retirement but it still appeared to be electronically 'live', making it an ideal target.<sup>10</sup>

According to the Union of Concerned Scientists (UCS), the satellite had a mass of just under one ton. The collision would be expected to completely break the satellite into fragments, the vast majority of which would orbit the Earth as space debris. Because this breakup took place at a high altitude where the atmospheric density is very low, a large fraction of this debris will remain in orbit for decades.

UCS calculates that the number of debris fragments with size greater than 1 mm that resulted from the breakup represents a significant increase in the total estimated amount of debris of this size at all altitudes up to 2,000 km, i.e., throughout low earth orbit (LEO). By February 2, 2007, the U.S. Space Surveillance Network had already cataloged more than 600 pieces of debris (presumably larger than 5 to 10 cm) from the Chinese test.<sup>11</sup>

UCS found that since the debris from this test is concentrated at altitudes near 850 km, it would double the density of debris larger than 1 cm in that region for at least five years. Moreover, UCS's estimate of at least 800 large pieces of debris emanating from the test is equal to the debris that would be added to LEO in 30 to 40 years of space launches under "business as usual," and 70 to 80 years of space activity if strict debris mitigation measures of the kind being discussed internationally were put in place.<sup>12</sup>

	Debris size		
	1 mm to 1 cm	1 cm to 10 cm	> 10 cm
Total debris in LEO before Chinese test	140 million	180,000	9,700
Debris from the FY-1C breakup	2 million	40,000	800

Source: Union of Concerned Scientists

China itself will be at risk from space debris. The Chinese are launching about 10 satellites every year and expect to have 100 in orbit by 2010 and 200 by 2020. China has in the past five years launched its first manned spacecraft, two remote-sensing satellite programs (Ziyuan-1 and Ziyuan-2) and an oceanographic research satellite, Haiyang-1 (HY-1). Moreover, China is also developing micro-satellites.<sup>13</sup>

## A Ban on Space Weapons – Further Away Than Ever?

In 2002, China and Russia proposed a treaty banning the deployment of weapons in space or attacks against space-based objects. China's concern was that the American missile defense system would lead to increasing use of space for military purposes and fuel an arms race. The

U.S. Government has refused to negotiate, saying such a treaty would be unenforceable and would only give an advantage to countries (i.e., China) that are trying to hide their efforts to develop weapons for use in space.<sup>14</sup>

If the intent of the Chinese in conducting the test was to pressure the United States into more actively pursuing a treaty on the "Prevention of an Arms Race in Outer Space," which would ban space weapons, they may have miscalculated. The test has certainly strengthened the position of U.S. hawks who claim that China poses a strategic threat to the United States.<sup>15</sup> U.S. advocates of putting weapons in space feel vindicated and expressed optimism for their own projects, which range from new kinds of defensive satellites to space weapons and orbital battle stations able to destroy all kinds of enemy arms.<sup>16</sup> Certainly the test makes it more difficult for the U.S. to ignore China's potential as a peer competitor in space. As one commentator wrote in the *Wall Street Journal*:

*The Bush administration is sounding a muted alarm over China's destruction, by means of an adapted ballistic missile, of an old weather satellite 530 miles [853 kilometers] up in space. We'd be better off treating the Jan. 11 test as a rare and useful gift. Wittingly or not, the Chinese have put paid to four decades of wishful thinking about the militarization of space -- and what America should do about it.*<sup>17</sup>

According to some news reports it appears that the Chinese leadership may not have been fully informed about the test before it took place. Bush administration officials said that they had been unable to get even the most basic diplomatic response from China after their detection of the test, and that they were uncertain whether China's top leaders, including President Hu Jintao, were fully aware of the test or the reaction it would engender.<sup>18</sup>

Subsequent remarks by a senior Chinese military officer predicting that weapons will be deployed in outer space despite her government's long-standing desire to prevent an arms race there did not do anything to reduce their fears. During a World Economic Forum dinner, Yao Yunzhu, a senior colonel in the People's Liberation Army, said "My wish is we really want to keep space as a peaceful place for human beings," adding that China would like all countries to come to a consensus that space should be used only for peaceful purposes. "But personally, I'm pessimistic about it," said Col. Yao, who directs the Asia-Pacific Office at the Academy of Military Science in Beijing. "My prediction: Outer space is going to be weaponized in our lifetime."<sup>19</sup>

Some defense analysts say the test is part of a broader Chinese effort to restrict the freedom of the U.S. military to maneuver in Asia -- especially in the areas off the Chinese coast and around Taiwan.<sup>20</sup>

It bears notice that it is not just the United States that feels uneasy about China's ASAT test. Russia has many of its military, intelligence and even communication satellites in low Earth orbit, somewhere between 320 and 800 kilometers above ground. Such distance puts them within easy reach of China's new capabilities. Furthermore, while Russia has advocated many changes to its military doctrine - including greater funding for its high-tech military assets - it still operates many satellites that were put into orbit toward the end of the Soviet Union or just after its breakup. Russia relies on these for its security; especially for the huge open spaces of Siberia and the Far East. Russia's sparse population in that region, the need to monitor the borders, and the existence of high profile military and R&D assets in Russia's eastern territory necessitate constant surveillance and observation. The recent economic development of the region - oil and natural-gas exploration and the importance Moscow now attaches to such industries - makes it ever more necessary to keep an eye on this expanse.<sup>21</sup>

In the aftermath of the Chinese test, some, such as James Hackett of the Heritage Foundation, say that because satellites today are crucial to the effective functioning of our society, we need weapons that will deter others from threatening them.<sup>22</sup> Thus, they call for increased support for

the U.S. program created in the 1990s as a way to develop means of interfering with a satellite's operations without destroying it and creating debris. That program is known as Applied Counterspace Technologies (ACT).<sup>23</sup>

The counterargument is that most U.S. satellites are not vulnerable to attack today nor are they likely to be in the years ahead. Therefore, threats may often be handled through relatively passive measures and through redundant systems rather than an all-out space weapons competition. The Chinese anti-satellite test does put lower-altitude reconnaissance systems in greater jeopardy, but not higher-altitude U.S.-communications and targeting satellites.<sup>24</sup>

## Conclusion: The Need for New 'Rules of the Road'

Recently, some of the most senior generals responsible for U.S. military operations in space, including Marine Corps Gen. James Cartwright, head of the U.S. Strategic Command, and Gen. Kevin Chilton, head of Air Force Space Command, say they see a need for international dialogue aimed at setting universal "rules of the road" for satellites in orbit.

The officers argue such talks could pave the way for a global forum to resolve ambiguous developments in space, helping the parties distinguish hostile from benign acts. The contact would be aimed at encouraging "transparency" and revealing less-than-peaceful uses of space, officials say. Presumably it would stop short of addressing an international ban on space weapons, which China proposed in 2002 and the Bush administration opposes.<sup>25</sup>

## Endnotes

---

<sup>1</sup> For further detail see Eric Hagt, "Chinas' ASAT Test: Strategic Response," pp. 31-51; and Theresa Hitchens, "U.S.-Sino Relations in Space: From "War of Words" to Cold War in Space?," *China Security*, Winter 2007.

<sup>2</sup> William J. Broad and David E. Sanger, op. cit.

<sup>3</sup> William J. Broad and David E. Sanger, "Flexing Muscle, China Destroys Satellite In Test," *New York Times*, January 19, 2007, Pg. 1.

<sup>4</sup> Wade Boese, "The USSR's Past Anti-Satellite Testing," *Arms Control Today*, March 2007, [http://www.armscontrol.org/act/2007\\_03/ChinaSatellite.asp](http://www.armscontrol.org/act/2007_03/ChinaSatellite.asp).

<sup>5</sup> For background see *Prevention of an Arms Race in Outer Space (PAROS) at the United Nations*, <http://www.reachingcriticalwill.org/legal/paros/parosindex.html>.

<sup>6</sup> *Statements made at the 2006 Session of the Conference on Disarmament*, <http://www.reachingcriticalwill.org/political/cd/speeches06/topics.html#paros>.

<sup>7</sup> Shaun Tandon, "China Shows Its Power With Anti Satellite Test," AFP, Jan 20, 20, [http://www.spacewar.com/reports/China\\_Shows\\_Its\\_Power\\_With\\_Anti\\_Satellite\\_Test\\_999.html](http://www.spacewar.com/reports/China_Shows_Its_Power_With_Anti_Satellite_Test_999.html).

<sup>8</sup> *U.S. National Space Policy*, Office of Science and Technology Policy, Executive Office of the President, The White House 31 Aug. 2006, released Oct 6, 2006,

<http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf>. See also Robert G. Joseph, Under Secretary for Arms Control and International Security, Remarks to Center for Space and Defense Forum Colorado Springs, Colorado, January 11, 2007, <http://www.state.gov/t/us/rm/78679.htm>. For more detail on past U.S. space policy see <http://www.globalsecurity.org/space/library/policy/national/index.html>. For a Chinese perspective on the U.S. policy see Bao Shixiu, "Deterrence Revisited: Outer Space," *China Security*, Winter 2007, pp. 2-11.

<sup>9</sup> Philip E. Coyle III, "The Chinese Satellite Destruction: What's next?," Center for Defense Information, Feb. 12, 2007, [http://www.cdi.org/program/document.cfm?DocumentID=3835&StartRow=1&ListRows=10&appendURL=&OrderBy=D.DateLastUpdated&ProgramID=68&from\\_page=index.cfm](http://www.cdi.org/program/document.cfm?DocumentID=3835&StartRow=1&ListRows=10&appendURL=&OrderBy=D.DateLastUpdated&ProgramID=68&from_page=index.cfm).

<sup>10</sup> Ibid.

<sup>11</sup> Wang Ting and David Wright, *Space Weapons and Technical Issues: Debris from China's Kinetic Energy ASAT Test*, February 2, 2007, [http://www.ucsusa.org/global\\_security/space\\_weapons/debris-from-chinas-asat-test.html](http://www.ucsusa.org/global_security/space_weapons/debris-from-chinas-asat-test.html).

<sup>12</sup> Ibid.

---

<sup>13</sup> Patrick M Cronin, "China targets more than a satellite," *Asia Times*, Feb 22, 2007, <http://atimes.com/atimes/China/IB22Ad01.html>.

<sup>14</sup> "Space invaders: China's shooting down of a satellite may be an effort to show that American supremacy in space is assailable," *Economist.com*, Jan 22nd 2007.

<sup>15</sup> "US Hawks Bolstered By China Weapons Test In Space," AFP, January 20, 2007, [http://www.spacewar.com/reports/US\\_Hawks\\_Bolstered\\_By\\_China\\_Weapons\\_Test\\_In\\_Space\\_999.html](http://www.spacewar.com/reports/US_Hawks_Bolstered_By_China_Weapons_Test_In_Space_999.html); and Jeff Kueter, "Crossing the Rubicon in Space Again: lacta alea est," Policy Outlook, George C. Marshall Institute, January 2007.

<sup>16</sup> William J. Broad, "Look Up! Is It A Threat? Or A Plea For A Ban?," *New York Times*, January 21, 2007.

<sup>17</sup> Bret Stephens, "China's Gift," *Wall Street Journal*, January 23, 2007, Pg. 18.

<sup>18</sup> David E. Sanger and Joseph Kahn, "U.S. tries to interpret silence over China anti-satellite test," *International Herald Tribune*, January 21, 2007.

<sup>19</sup> Edith M. Lederer, [Associated Press], "Chinese Colonel Sees Arms In Space," *Washington Times*, January 27, 2007, Pg. 1.

<sup>20</sup> Gordon Fairclough and Jay Solomon, "China's Arms Test Unnerves Its Neighbors," *Asian Wall Street Journal*, January 22, 2007, Pg. 3.

<sup>21</sup> "A nasty jolt for Russia," *Asia Times*, Jan 23, 2007, <http://atimes.com/atimes/China/IA23Ad03.html>.

<sup>22</sup> James Hackett, "Satellite Strike Protection," *Washington Times*, January 28, 2007, Pg. B1.

<sup>23</sup> Keith J. Costa, "ASAT Technology Test Bed in the Works at Redstone Arsenal," *Inside Missile Defense*, December 22, 2004; and "KE ASAT 4-Ever," March 11, 2005, <http://www.armscontrolwonk.com/474/ke-asat-4-ever>.

<sup>24</sup> Michael E. O'Hanlon, "A Space Weapons Race is Not the Answer for America," *Financial Times*, January 22, 2007, <http://www.brookings.edu/views/op-ed/ohanlon/20070122.htm>.

<sup>25</sup> Elaine M. Grossman, "Spratt urges discussion with China: HOUSE DEMS EYE LEGISLATION TO PRESS BUSH ON ARMS CONTROL FOR SPACE," *Inside Defense News*, Feb 1, 2007.