

An hourglass-shaped graphic with a globe in the top bulb and another globe in the bottom bulb. The top bulb is dark blue, and the bottom bulb is light blue. The hourglass is centered on the page.

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*China's Space Program: Options for U.S.-China Cooperation*

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**Abstract.** This report outlines recent activities and future plans in China's civilian space sector. It also discusses benefits and trade-offs of possible U.S.-China collaboration in space, as well as several options to improve space relations, including information exchange, policy dialogue, and joint activities.

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## CRS Report for Congress

# China's Space Program: Options for U.S.-China Cooperation

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### Summary

China has a determined, yet still modest, program of civilian space activities planned for the next decade. The potential for U.S.-China cooperation in space — an issue of interest to Congress — has become more controversial since the January 2007 Chinese anti-satellite test. The test reinforced concerns about Chinese intentions in outer space and jeopardized space assets of more than two dozen countries by creating a large cloud of orbital space debris. Some argue that Chinese capabilities now threaten U.S. space assets in low earth orbit. Others stress the need to expand dialogue with China.

This report outlines recent activities and future plans in China's civilian space sector. It also discusses benefits and trade-offs of possible U.S.-China collaboration in space, as well as several options to improve space relations, including information exchange, policy dialogue, and joint activities. For more information, see CRS Report RS21641, *China's Space Program: An Overview*, by Marcia S. Smith.

### Introduction

China has made clear advances in space capabilities over the past decade. The country has launched over 100 orbital missions since 1970, including a string of 50 consecutive successful Long March rocket launches from 1996 to 2006, after overcoming technical problems with the help of U.S. companies in the mid-1990s.<sup>1</sup> China sent humans into space in 2003 and 2005, and orbited a lunar explorer in October 2007 that is paving the way for additional moon exploration. China is now a world leader in yearly space launches, yet remains notably less active than Russia or the United States, as shown in **Table 1**.

China's space program was initially institutionalized under the People's Liberation Army (PLA). In a series of government reforms in the 1990s, the China National Space

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<sup>1</sup> See CRS Report 98-485, *China: Possible Missile Technology Transfers under U.S. Satellite Export Policy — Actions and Chronology*, by Shirley A. Kan.

Administration (CNSA) — roughly equivalent to the U.S. National Aeronautics and Space Administration (NASA) — was created under the civilian Commission of Science, Technology and Industry for National Defense. The PLA continues to play a role in China's overall space activities, managing both manned civilian and military efforts, while CNSA handles unmanned scientific projects and international collaboration. China's space activities and intentions are not transparent; the dual-use nature of most space technology compounds the uncertainties of interpreting Chinese decision making.

**Table 1. Reported Spaceflights Launched by Country, 2003-2007**

	Russia	U.S.	China	EU	Japan	India
2003	21	26	7	4	3	2
2004	23	19	8	3	0	1
2005	26	16	5	5	2	1
2006	25	23	6	5	6	1
2007	22	16	10	5	2	3

Source: NASA, "The Year in Review," 2003-2006, and *Space News*, 2007.

China's Space White Paper of 2006 states that Chinese space activities are subservient to domestic social and economic development goals, which include national security.<sup>2</sup> China has been a strong proponent of an arms control regime in space and has argued for the peaceful use of outer space in the United Nations' Conference on Disarmament and at the Prevention of an Arms Race in Outer Space dialogue. Some claim that China takes this stand in order to prevent further progress by the United States in space while allowing it to covertly catch up.<sup>3</sup>

China's spending on space is growing, although details are often not available. The CNSA reports to have a budget about one-tenth the size of NASA's.<sup>4</sup> Western experts estimate Chinese space spending at \$1.4-2.2 billion per year, on par with France and Japan.<sup>5</sup> Chinese budget opacity, the dual-use nature of most space technology, and currency conversion difficulties make direct comparisons uncertain.

China collaborates with other countries on civilian space activities, but it is not considered a key member of the international space community.<sup>6</sup> Currently, China collaborates with Russia, the European Union (EU), Brazil, Canada, Nigeria, and others. The Russian partnership is probably the most active and has benefitted China's manned space effort significantly. A China-EU collaborative framework on space has been in

<sup>2</sup> "China's Space Activities in 2006," White Paper issued by the Information Office of the State Council of the People's Republic of China, October 2006.

<sup>3</sup> See, for example, speech by Senator Jon Kyl, "China's Anti-Satellite Weapons and American National Security," delivered on January 29, 2007, at the Heritage Foundation.

<sup>4</sup> "Chinese Annual Space Budget Exceeds Two Billion Dollars," *Space Daily*, Beijing, October 12, 2006.

<sup>5</sup> Dean Cheng, *Space News*, "Dragons in Orbit: China's Space Program Merits Greater Attention," 21 August 2006.

<sup>6</sup> This was concluded by a panel of U.S. experts on Chinese space activities. "China's Space Program: Civilian, Commercial and Military Aspects," CNA Conference Report, May 2006.

place since 1998. This includes cooperation on the EU-led Galileo satellite positioning system, but progress on this has been slow and sometimes controversial. Competition in space also exists among China, India, Japan, and South Korea. Although there may be military implications to this competition, each country seems more focused on building national pride by displaying technology prowess.

## China's Human Space Flight Program

China's program to launch humans into space began earnestly in 1992 and is designated as "Project 921." China has apparently chosen the more expensive route of sending humans into space, over machines, for the wider attention it attracts both domestically and internationally. A manned program builds greater national prestige — an increasingly important political benefit in China — and by drawing international attention to the country's technical capabilities.

China has made steady, although unremarkable progress in its human space schedule. Compared to the U.S. Apollo and Soviet Soyuz programs of the 1960s and 1970s, China's Shenzhou effort is far more modest.<sup>7</sup>

Project 921 is divided into three phases. Phase I included the first five Shenzhou flights, culminating in China's first human spaceflight on October 15, 2003. Phase II began with Shenzhou 6, which flew two Chinese taikonauts<sup>8</sup> on a five-day mission starting on October 12, 2005. Shenzhou 7 was a three-day mission starting on September 24, 2008, and built experience with extra-vehicular activities. Shenzhou 8, 9, and 10 are scheduled for 2009-2010 and will attempt to establish a space laboratory module with docking capability. Shenzhou 9 will test docking procedures with the module delivered by Shenzhou 8, and Shenzhou 10 will carry a crew to the module. Phase III is less well developed, but includes establishing a permanent space station. China claims that it has not set a date for development of the station.<sup>9</sup> The Shenzhou modules have been designed to dock at the International Space Station if that becomes politically feasible in the future.

## China's Lunar Exploration Activities and Beyond

On October 24, 2007, China successfully launched Chang-e 1, the country's first lunar probe. Approximately 14 days later, the probe entered final orbit around the moon. China became the fourth country to orbit a satellite around the moon; Japan became the third only weeks before China. Orbiting 200 kilometers (124 miles) above the surface, China's explorer uses stereo cameras and X-ray spectrometers to map three dimensional images of the lunar surface. One goal of the mission is to begin mapping potential lunar resources that could some day be used by Chinese industry. China plans to send Chang-e 2, equipped with a robotic lunar rover, to the moon around 2012. Approximately five years later, Chang-e 3 is scheduled to send another rover to collect samples that will be

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<sup>7</sup> Steve Dutch, "Chronology of Pre-Space Shuttle Manned Space Flight," University of Wisconsin-Green Bay, September 1998.

<sup>8</sup> "Taikonaut" is sometimes used in English language documents to distinguish Chinese space explorers from astronauts and cosmonauts.

<sup>9</sup> "China Denies Timetable for Space Station," *Xinhua*, November 7, 2007.

returned to Earth.<sup>10</sup> After this third phase, an effort to send humans to the moon will commence, but China denies that it has a timetable for this effort.<sup>11</sup>

China also has plans to explore Mars and the outer solar system and is discussing collaboration with Russia to do so. These plans are more vague and uncertain than Program 921 and the lunar exploration.

## U.S.-China Space Cooperation

China and the United States have a limited history of both civilian and military collaboration in space. China has publicly pushed for more dialogue and joint activities. Mistrust of Chinese space intentions grew in the mid-1990s when U.S. companies were accused of transferring potentially sensitive military information to China.<sup>12</sup> Since then, cooperation has stagnated, often roiled by larger economic, political, and security frictions in the U.S.-China relationship.

In September 2006, NASA Administrator Michael Griffin visited his Chinese counterpart, Laiyan Sun, in China. He couched the visit as a “get acquainted” opportunity rather than the start of any serious cooperation in order to keep expectations low. No follow-on activities were announced after the trip, although the Chinese issued a four-point proposal for ongoing dialogue between the two organizations that stressed annual exchanges and confidence building measures.<sup>13</sup>

On January 11, 2007, China conducted its first successful anti-satellite (ASAT) weapons test, destroying one of its inactive weather satellites.<sup>14</sup> No advance notice of the test was given, nor has China yet explained convincingly the intentions of the test.<sup>15</sup> The international community condemned the test as an irresponsible act because it polluted that orbital slot with thousands of pieces of debris that will threaten the space assets of more than two dozen countries, including China’s, for years.

Understanding the nuances of China’s intent in conducting the test is important, but remains open to interpretation. How was the decision made to conduct a test that would contradict Beijing’s publicly-held position on the peaceful use of outer space, and that would almost certainly incur international condemnation? Some speculate that the United

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<sup>10</sup> Launch dates for Chang-e 2 and 3 may depend on development of the new, heavy-lift Long March 5 booster rocket and the launch facility under construction on Hainan Island.

<sup>11</sup> “China Has No Timetable for Manned Moon Landing,” *Xinhua*, October 25, 2007.

<sup>12</sup> CRS Report 98-485, *China: Possible Missile Technology Transfers under U.S. Satellite Export Policy — Actions and Chronology*, by Shirley A. Kan.

<sup>13</sup> “China Offers 4-Point proposal to boost Sino-U.S. Space Co-Op,” The Chinese Government’s Official Web Portal, [<http://www.gov.cn>], September 25, 2006.

<sup>14</sup> See CRS Report RS22652, *China’s Anti-Satellite Weapon’s Test*, by Shirley A. Kan.

<sup>15</sup> In a March 2007 press conference, Premier Wen Jiabao reiterated that the test was not directed against any one country and that China’s position on the peaceful use of outer space remained unchanged. “Premier Wen Jiabao’s Press Conference,” Ministry of Foreign Affairs of the People’s Republic of China, March 17, 2007.

States' unilateral positions encouraged China to conduct the test to demonstrate that it could not be ignored.<sup>16</sup> In particular, the U.S. National Space Policy issued in September 2006 declares that the United States would “deny, if necessary, adversaries the use of space capabilities hostile to U.S. national interests.”<sup>17</sup> Given China's apparent commitment to space, the growing U.S. dependence on space for security and military use, and Chinese concerns over Taiwan, the ASAT test may have been a demonstration of strategic Chinese deterrence.<sup>18</sup> Others saw a more nefarious display of China's space capabilities, and a sign that China has more ambitious objectives in space.<sup>19</sup> Still others speculate that the engineers running China's ASAT program simply wanted to verify the technology that they had spent decades developing and significantly underestimated the international outrage the test provoked.<sup>20</sup>

The Chinese ASAT test seemed to derail any movement to build on the meeting between NASA and CNSA. Some believe that China's ASAT test will continue to dampen momentum that might have been building for the two countries to expand cooperation, while others argue that it is a pressing reason to boost dialogue.<sup>21</sup>

**Challenges of Cooperating with China.** Some of the most important challenges of expanding cooperation in space with China include:

- Inadvertent technology transfer. From this perspective, increased space cooperation with China should be avoided until Chinese intentions are clearer. Joint space activities could lead to more rapid (dual-use) technology transfer to China, and in a worst-case scenario, result in a “space Pearl Harbor,” as postulated by a congressionally appointed commission led by Donald Rumsfeld in 2001.<sup>22</sup>
- Moral compromise. China is widely criticized for its record on human rights and non-democratic governance. Any collaboration that improves the standing of authoritarian Chinese leaders might thus be viewed as unacceptable.

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<sup>16</sup> William J. Broad and David E. Sanger, “Flexing Muscle, China Destroys Satellite in Test,” *New York Times*, January 19, 2007.

<sup>17</sup> Office of Science and Technology Policy, *U.S. National Space Policy*, August 31, 2006.

<sup>18</sup> Eric Hagt, “China's ASAT Test: Strategic Response,” *China Security*, World Security Institute, Winter 2007.

<sup>19</sup> See, for example, Statement of Michael Pillsbury to the U.S.-China Economic and Security Review Commission, “Hearing on China's Military Modernization and its Impacts on the U.S. and the Asia Pacific,” March 30, 2007.

<sup>20</sup> This speculation is attributed to Joan Johnson-Freese in May 7, 2008 testimony to the Senate Committee on Commerce, Science and Transportation. D. Shiga, “Did ‘Naive Engineers’ Spur China's Anti-Satellite Test?” *New Scientist Space*, May 7, 2008.

<sup>21</sup> Philip Saunders and Charles Lutes, “China's ASAT Test: Motivations and Implications,” National Defense University, June 2007.

<sup>22</sup> “Report of the Commission to Assess United States National Security Space Management and Organization,” Washington, DC, January 11, 2001.

- Ineffectiveness. Some argue that increased collaboration will not produce tangible benefits for the United States, especially without a new bilateral political climate.<sup>23</sup>

**Benefits of Cooperating with China.** The potential benefits of expanded cooperation and dialogue with China include:

- Improved transparency. Regular meetings could help the two nations understand each others' intentions more clearly. Currently, there is mutual uncertainty and mistrust over space goals, resulting in the need for worst-case planning.
- Offsetting the need for China's unilateral development. Collaborating with China — instead of isolating it — may keep the country dependent on U.S. technology rather than forcing it to develop technologies alone. This can give the United States leverage in other areas of the relationship.
- Cost savings. China now has the economic standing to support joint space cooperation. Cost-sharing of joint projects could help NASA achieve its challenging work load in the near future. Some have argued that U.S. space commerce has suffered from the attempt to isolate China while doing little to keep sensitive technology out of China.

### **Options for Possible Cooperation.**

- Information and data sharing. Confidence building measures (CBMs) such as information exchange on debris management, environmental and meteorological conditions, and navigation, are widely considered an effective first step in building trust in a sensitive relationship. NASA has done some of this with CNSA in the past, but more is possible.
- Space policy dialogue. Another area of potential exchange could begin with “strategic communication,”<sup>24</sup> an attempt for each side to more accurately understand the other's views, concerns, and intentions. Dialogue on “rules of the road,” a “code of conduct,” or even select military issues could be included.
- Joint activities. This type of cooperation is more complex and would probably require strong political commitments and confidence building measures in advance. Bi- and multi-lateral partnerships on the international space station, lunar missions, environmental observation, or solar system exploration are potential options. A joint U.S.-Soviet space docking exercise in 1975 achieved important technical and political breakthroughs during the Cold War.

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<sup>23</sup> “China's Space Program: Civilian, Commercial and Military Aspects,” CNA Conference Report, May 2006.

<sup>24</sup> Joan Johnson-Freese, “Strategic Communication with China: What Message About Space?,” *China Security*, World Security Institute, 2006.