

# ANTI-SATELLITE TESTS IN SPACE— THE CASE OF CHINA

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## Summary

Over the last several years, China has conducted seven tests in space of direct ascent ASAT systems. While at least three of these tests included the destruction of a target, only one, conducted on January 11, 2007, resulted in the creation of long-lived orbital debris. This fact sheet collates what is known and what is theorized about China's ASAT testing in space. While there is no conclusive proof, the publicly-available evidence strongly suggests that China is developing at least two different ASAT systems that could be able to attack satellites in both low Earth orbit (LEO) and high altitude orbits, potentially including geostationary Earth orbit (GEO).

## Direct Ascent Tests In Low Earth Orbit

Several Chinese ASAT tests in space appear to be of a ground-based, direct ascent ASAT system based on a modified DF-21 (NATO codename CSS-5) road mobile medium range ballistic missile (MRBM), designated SC-19 by the U.S. intelligence community.<sup>1</sup> The kinetic kill vehicle (KKV) reportedly weighs 600 kilograms and uses an imaging infra-red seeker to identify and track its target.<sup>2</sup> Based on the range of the DF-21, the SC-19 likely has a range of around 1,000 to 1,500 kilometers in altitude, making it potentially effective against most LEO satellites.

China has tested the SC-19 system multiple times. On July 7, 2005, the system was tested without a known target, likely to demonstrate the performance of the rocket.<sup>3</sup> On February 6, 2006, the system was tested again, this time with the interceptor passing near a satellite target without striking it.<sup>3</sup> It is unknown if a close approach or collision was intended. On January 11, 2007, China tested the SC-19 again, this time deliberately hitting and destroying one of its own aging weather satellites at an altitude of 865 kilometers.<sup>4</sup> The collision created more than 3,000 pieces of trackable space debris (defined as larger than 10 cm in size) which are expected to remain in orbit for decades.<sup>5</sup>

On January 11, 2010, China conducted a test of what Chinese officials called a "ground-based midcourse missile interception technology" against a ground-launched ballistic missile target, an event confirmed by the U.S. military.<sup>6</sup> A classified U.S. State Department cable made public by Wikileaks indicates that the U.S. military believed the test to be of the SC-19 system.<sup>7</sup> On January 27, 2013, China conducted what officials called a "mid-course missile interception test" similar to the test conducted on January 11, 2010.<sup>8</sup> This has led to speculation, but not outright confirmation, that this was yet another test of the SC-19 ASAT system.

On July 25, 2014, the U.S. State Department released a statement accusing China of conducting another ASAT test two days earlier, on July 23, 2014, stating it was a "non-destructive test of a missile designed to destroy satellites,"<sup>9</sup> and that it had a similar profile to the 2007 ASAT test.<sup>10</sup> China denied it was an ASAT test, stating that it was a land-based missile intercept test that "achieved its preset goal."<sup>9</sup>

## Direct Ascent Tests In High Altitude Orbits

On May 13, 2013, China launched a rocket from the Xichang Satellite Launch Center in Sichuan Province in southwestern China.<sup>11</sup> The Chinese Academy of Sciences stated that it was a high-altitude scientific experiment that reached more than 10,000 kilometers in altitude before releasing a canister of barium powder.<sup>12</sup> A spokeswoman for U.S. Strategic Command stated that launch “appeared to be on a ballistic trajectory nearly to geosynchronous Earth orbit” and that while the U.S. military tracked several objects from the launch, they all re-entered over the Indian Ocean<sup>13</sup> after a flight time of 9.5 hours.<sup>10</sup> Unnamed defense officials said that the launch was the test of a new ballistic missile, potentially called the Dong-Ning or DN-2, which could be used in a future ASAT system that would be capable of reaching high altitude satellites.<sup>13</sup>



*Imagery of Xichang from April 3, 2013, showing a TEL on the southeast pad. Image © 2013 DigitalGlobe.*

Although there is no public proof that this was indeed a test of a new ASAT system, the publicly-available evidence is more in line with a direct ascent ASAT test than a scientific experiment. Google Earth satellite imagery of Xichang indicates that there were no known Chinese space launch vehicles on the launch pad that matched the description of the rocket given in the Chinese media.<sup>15</sup> However, a commercial satellite image taken on April 3, 2013, did show what appears to be a transporter-erector-launcher (TEL), usually associated with mobile ballistic missiles, on a mobile launch pad constructed at Xichang between November 2006 and April 2012. An analysis of the launch trajectory indicates that a re-entry over the Indian Ocean is consistent with a ballistic trajectory that has an apogee around 30,000 kilometers.<sup>15</sup> A further analysis conducted by Dr. Wang Ting found no corroborating evidence to support the claim of a scientific payload or mission, and concluded that the most likely target for such an ASAT system was U.S. early warning satellites located over Asia.<sup>16</sup>

## Summary of Known or Suspected Chinese ASAT Tests in Space

Date	ASAT System	Target	Altitude Reached	Result
July 7, 2005	SC-19 <sup>3</sup>	None known	Unknown (likely LEO)	Likely rocket test
February 6, 2006	SC-19 <sup>3</sup>	Unknown satellite <sup>6</sup>	Unknown (likely LEO)	Likely flyby of orbital target <sup>3</sup>
January 11, 2007	SC-19 <sup>4</sup>	FY-1C satellite <sup>4</sup>	865 km <sup>4</sup>	Destruction of orbital target, 3,000+ pieces of orbital debris <sup>5</sup>
January 11, 2010	SC-19 <sup>6</sup>	CSS-X-11 ballistic missile <sup>6</sup>	250 km <sup>7</sup>	Destruction of target, no orbital debris <sup>7</sup>
January 27, 2013	Possibly SC-19	Unknown ballistic missile <sup>8</sup>	Unknown	Destruction of target, no orbital debris <sup>8</sup>
May 13, 2013	Possibly DN-2	None known	10,000 <sup>11</sup> to 30,000 km <sup>12</sup>	Likely rocket test <sup>14</sup>
July 23, 2014	SC-19 <sup>10</sup>	None known	Unknown (likely LEO) <sup>10</sup>	Non-destructive test <sup>9</sup>

## Endnotes

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