Fact Sheet

CHINESE DIRECT-ASCENT ANTI-SATELLITE TESTING

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CONTACT: VICTORIA SAMSON
VSAMSON@SWFOUND.ORG

SECURE WORLD FOUNDATION

SUMMARY

China has at least one, and possibly as many as three, programs underway to develop direct-ascent anti-satellite (DA-ASAT) capabilities, either as dedicated counterspace systems or as midcourse missile defense systems that could also provide counterspace capabilities. Chinese DA-ASAT capability against LEO targets is likely mature and potentially operationally fielded on mobile launchers. Chinese DA-ASAT capability against deep space targets (MEO and GEO) is likely still in the experimental or development phase, and there is not sufficient evidence to conclude whether it will become an operational capability in the near future. Since 2005, China has conducted over a dozen tests of DA-ASAT capabilities, although only one, conducted on January 11, 2007, resulted in the creation of long-lived orbital debris.

DIRECT-ASCENT ASAT PROGRAMS

DA-ASATs use a ground, air, or sea-launched rocket to place a kinetic kill vehicle (KKV) on a ballistic trajectory up into space. After separation from the rocket, the KKV uses onboard guidance, navigation, and control systems to identify and track a targeted space object and fine-tune its trajectory to create a hypervelocity collision. DA-ASATs are very similar to midcourse missile defense interceptors, with the difference being the missile defense targets are also on ballistic trajectories. Unlike a co-orbital ASAT, the DA-ASAT KKV itself does not have enough velocity to achieve orbit and any resulting fragments are likewise unlikely to remain in orbit unless an orbital object was destroyed.

The Chinese direct-ascent ASAT program has its roots in several anti-ballistic and surface-to-air missile programs that emerged from the 1960s through the 1990s. Since then, China has demonstrated significant advances in its hit-to-kill (HTK) capability and engaged in large-scale modernization and development efforts for advanced rocket technology, tracking, targeting, and SSA capabilities, and launch infrastructure, both mobile and stationary.

CHINESE DA-ASATS FOR 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 road-mobile medium-range ballistic missile (MRBM), designated SC-19 by the U.S. intelligence community[1]. The KKV reportedly weighs 600 kilograms and uses an imaging infrared seeker to identify and track its target[2]. 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[3]. On February 6, 2006, the system was tested again, this time with the interceptor passing near a satellite target without striking it[4]. 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 FengYun 1C aging weather satellites at an altitude of 865 kilometers[5]. The collision created 3,533 pieces of trackable space debris (defined as larger than 10 cm in size), which are expected to remain in orbit for decades; as of February 2025, 2,535 pieces still remain in orbit[6].

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 and believed to be a test of the SC-19 system[7]. On January 27, 2013, China conducted another "midcourse missile interception test" similar to the 2010 test[8]. This has led to speculation, but not outright confirmation, that this was yet another test of the SC-19 ASAT system.

In 2014, the U.S. State Department released a statement accusing China of conducting another ASAT test on July 23, 2014, stating it was a "non-destructive test of a missile designed to destroy satellites,"[9] and that it had a similar profile to the 2007 ASAT test[10]. China denied it was an ASAT test, stating that it was a land-based missile intercept test that "achieved its preset goal."[11]

Since 2014, evidence suggests China has conducted at least six more tests that may be linked to their SC-19 DA-ASAT program or new variants. A launch on October 30, 2015, created unusual contrails that were seen on Chinese social media.[12] Photos from another test on July 22, 2017, were captured by a pilot on a Dutch commercial airliner flying over the Himalayas.[13] On February 5, 2018, Chinese state media announced it had carried out a "land-based mid-course missile interception test within its territory."[14] In all three cases, anonymous U.S. officials were cited by news sources claiming that the tests were of a system called DN-3.[15] However, there is no publicly available evidence to support the claims that these were actually ASAT tests, whether the DN-3 was the same as the SC-19 or a new system, or whether it is primarily an ASAT weapon.[16] More recently there have been Chinese announcements about 'missile intercept technology tests' in February 2021, June 2022, and April 2023, which were similar to statements made following previous DA-ASAT tests.[17] As of April 2021, the U.S. Office of the Director of National Intelligence officially assessed that China "had fielded ground-based ASAT missiles intended to destroy satellites in LEO."[18]

CHINESE DA-ASATS FOR HIGH ALTITUDE ORBITS

On May 13, 2013, China launched a rocket from the Xichang Satellite Launch Center.[19] The Chinese Academy of Sciences announced that it was a high-altitude scientific experiment that reached more than 10,000 kilometers in altitude before releasing a canister of barium powder.[20] Yet, a spokeswoman for U.S. Strategic Command stated that launch "appeared to be on a ballistic trajectory nearly to geosynchronous Earth orbit".[21] 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 was capable of reaching high altitude satellites.[22] 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. The details of the launch were different from those of either a standard satellite launch to GEO or the launch of a sounding rocket. 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.[23] 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.[24] 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.[25] 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.[26]

Summary of Known or Suspected Chinese DA-ASAT Tests in Space

Date	Interceptor	Launch Site	Target	Altitude Reached	Debris Created [27]	Comment
July 2005	SC-19	Xichang	None known	?	Likely rocket test	Likely rocket test
Feb. 6, 2006	SC-19	Xichang	Unknown satellite	?	Likely near-miss of orbital target	Likely near-miss of orbital target
Jan. 11, 2007	SC-19	Xichang	FY-1C satellite	865 km	Destruction of orbital target, debris created	Destruction of orbital target, debris created
Jan. 11, 2010	SC-19	Korla	CSS-X-11 ballistic missile launched from Jiuquan	250 km	Destruction of suborbital target	Destruction of suborbital target
Jan 27, 2013	Possible SC-19	Korla	Unknown ballistic missile launched from Jiuquan	Suborbital	Destruction of suborbital target	Destruction of suborbital target
May 13, 2013	Possible DN-2	Xichang	None known	~30,000 km	Likely rocket test	Likely rocket test
July 23, 2014	Possible DN-2	Korla? (Jiuquan?)	Likely ballistic missile launched from Jiuquan	Suborbital	Likely intercept test	Likely intercept test
Oct. 30, 2015	Possible DN-3	Korla	None known, possible ballistic missile	Suborbital	Likely rocket test	Likely rocket test
July 23, 2017	Possible DN-3	Jiuquan?	Likely ballistic missile	Suborbital, malfunctioned	Likely intercept test	Likely intercept test
Feb. 5, 2018	Possible DN-3	Korla	Likely ballistic missile	Suborbital	Likely intercept test	Likely intercept test
Feb. 4, 2021	Possible DN-3	Korla	Likely ballistic missile	Suborbital	Likely intercept test	Likely intercept test
June 19, 2022	Possible DN-3	Korla	Likely ballistic missile	Suborbital	Likely intercept test	Likely intercept test
April 14, 2023	Possible DN-3	Korla	Likely ballistic missile	Suborbital		

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525 Zang Street, STE. D
Broomfield, CO 80021 USA
v : + 1 303 554 1560

1779 Massachusetts Ave. NW
Washington, DC 20036 USA
v : + 1 202 568 6212

e : info@swfound.org

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