

The Threat of Anti-satellite Weapons (ASATs) and What Can Be Done About It

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SECURE
WORLD
FOUNDATION



Overview

- About SWF
- Definitions and examples of counterspace capabilities
- History of counterspace weapons development and testing
- Current multilateral discussions and initiatives
- Open questions and challenges



Who we are

- Secure World Foundation (SWF) is a **privately-funded operating foundation** that promotes cooperative solutions for space sustainability
- **Our vision:** The secure, sustainable, and peaceful uses of outer space that contribute to global stability on Earth
- **Our mission:** Secure World Foundation works with governments, industry, international organizations, and civil society to develop and promote ideas and actions to achieve the secure, sustainable, and peaceful uses of outer space benefiting Earth and all its peoples



Why counterspace?

- Counterspace capabilities are technologies that can **ensure the ability to use space for one's own purposes while denying it to an adversary**
 - Defensive counterspace, offensive counterspace, and situational awareness
- Originally developed during the Cold War alongside the birth of space capabilities
- Increased focus today as more countries look to use space for military/national security purposes



Counterspace capabilities

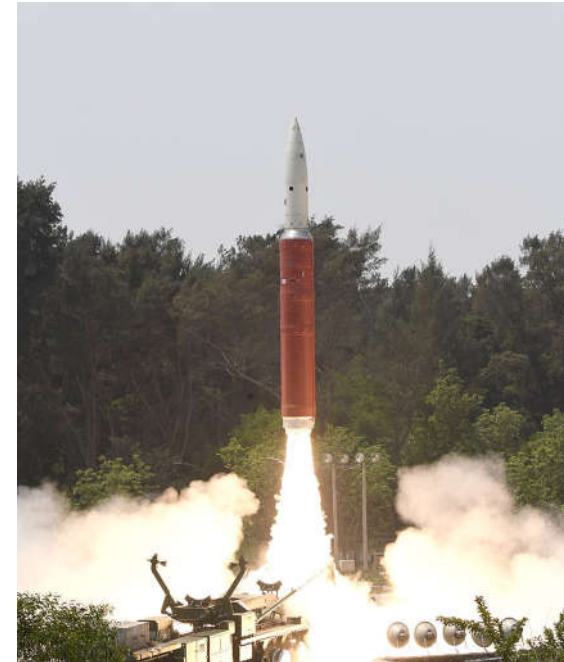
- **Direct Ascent:** weapons that use ground, air-, or sea-launched missiles with interceptors that are used to kinetically destroy satellites through force of impact, but are not placed into orbit themselves;
- **Co-orbital:** weapons that are placed into orbit and then maneuver to approach the target to attack it by various means, including destructive and non-destructive;
- **Directed Energy:** weapons that use focused energy, such as laser, particle, or microwave beams to interfere or destroy space systems;
- **Electronic Warfare:** weapons that use radiofrequency energy to interfere with or jam the communications to or from satellites;
- **Cyber:** weapons that use software and network techniques to compromise, control, interfere, or destroy computer systems.
- **Space Situational Awareness:** knowledge about the space environment and human space activities that enables both offensive and defense counterspace operations



Example: Direct Ascent



Launch of an ASM-135 ASAT missile from an F-15 (Image credit: [U.S. Air Force](#))



Launch of an Indian PDV Mk II as part of Mission Shakti (Image credit [Indian Defence Research and Development Organization](#))



Example: Co-orbital

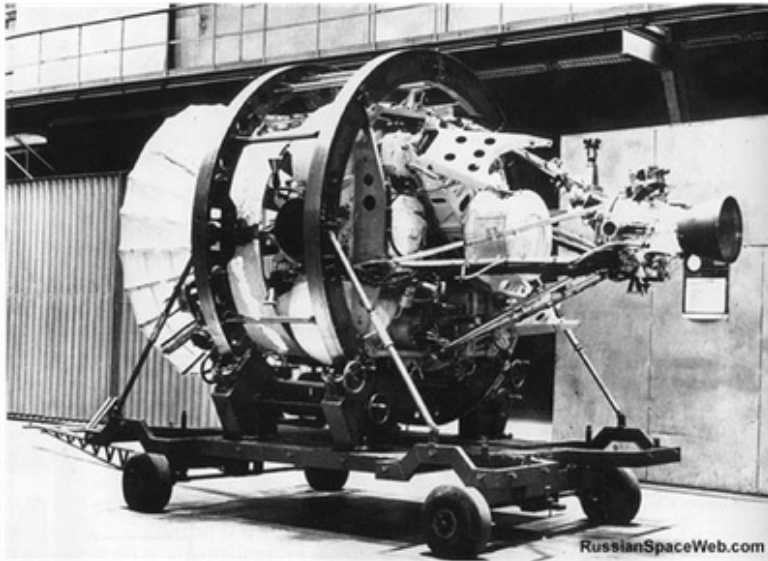


Photo of the Soviet IS co-orbital satellite during ground processing. Image courtesy of the Russianspaceweb.com Credit: TsNII Kometa

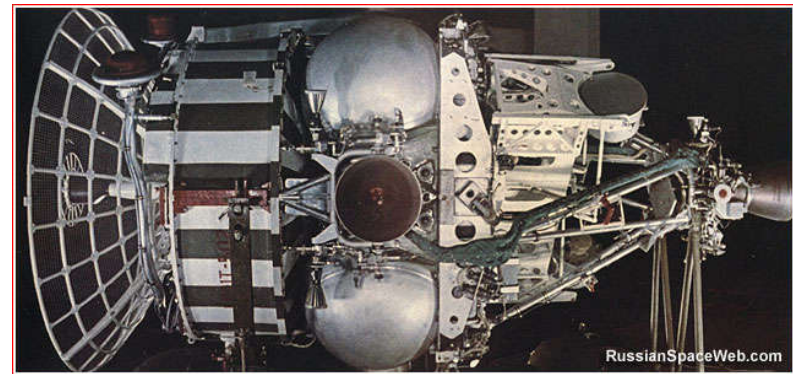


Photo of another version of the Soviet IS co-orbital satellite. Image courtesy of the Russianspaceweb.com Credit: TsNII Kometa



Example: Directed Energy



Russian Peresvet mobile laser dazzler



Russian Beriev A-60 airborne laser dazzler
Image credit: Oleg Ziminov / Russianplanes.net



*Potential directed energy site near Bohu, Xinjiang,
Nov. 15, 2013 (Image courtesy of Maxar
Technologies)*



Example: Electronic Warfare



Russian mobile counterspace EW systems deployed in Eastern Ukraine. Source: [OSCE](#) (April 3, 2019)



U.S. Counter Communications System Block 10.2. Credit: [U.S. Space Force](#)



Example: Cyber

1 minute read · February 28, 2022 2:02 PM GMT+1 · Last Updated a year ago

Satellite firm Viasat probes suspected cyberattack in Ukraine and elsewhere

US satellite operator says persistent cyberattack at beginning of Ukraine war affected tens of thousands of customers

By [Sean Lyngaas](#), CNN

Published 5:14 PM EDT, Wed March 30, 2022

Viasat cyberattack blamed on Russian wiper malware

[Carly Page](#) @carlypage_ / 7:00 PM GMT+2 · March 31, 2022

US, UK and EU blame Russia for 'unacceptable' Viasat cyberattack

[Carly Page](#) @carlypage_ / 2:54 PM GMT+2 · May 10, 2022

Comment

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Example: Space Situational Awareness



British phased array tracking radar at Fylingdales. (Image credit: [Cherubinko](#))



Russian Okno space imaging telescope. (Image credit: [Mil.ru](#))



U.S. Space-based Space Surveillance satellite. (Image credit: [U.S. Air Force](#))



Global Counterspace Capabilities

2022 Global Assessment

	U.S.	Russia	China	India	Aus.	France	Iran	Japan	North Korea	South Korea	U.K.
LEO Co-Orbital	■	▲	■	●	●	●	●	●	●	●	●
MEO/GEO Co-Orbital	■	▲	■	●	●	●	●	●	●	●	●
LEO Direct Ascent	■	▲	▲	■	●	●	●	●	●	●	●
MEO/GEO Direct Ascent	■	▲	■	●	●	●	●	●	●	●	●
Directed Energy	■	▲	■	●	●	■	●	●	●	●	●
Electronic Warfare	▲	▲	▲	■	●	■	■	●	■	●	●
Space Situational Awareness	▲	▲	▲	■	■	■	■	■	●	■	■

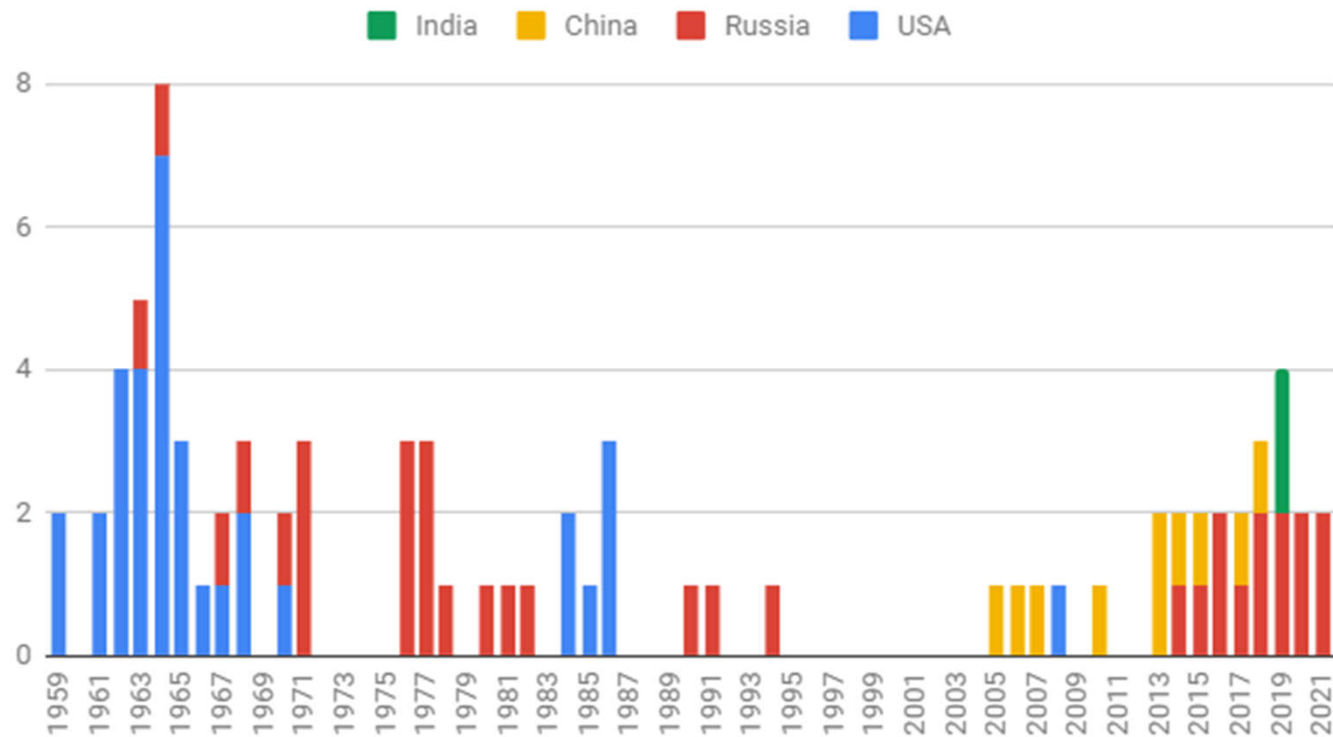
Legend: none ● some ■ significant ▲

<https://swfound.org/counterspace>



History of ASAT Tests in Space

ASAT Tests by Year





State of Multilateral Discussions

- No forward movement on space security and stability discussions at the UN for decades
 - Disagreement on nature of the threat and how to respond
 - Russia/China continue to push Treaty on the Prevention of Placement of Weapons in Outer Space (PPWT) and No First Placement Pledge (NFP)
 - U.S./West have not offered any alternatives, other than a push for voluntary norms
- UNGA 75/36: Dec. 2020
 - [National submissions](#) to the UNSC on nature of the threat to space, responsible/irresponsible behavior, and possible paths forward
 - Some commonalities: act with due regard, avoid harmful interference, no non-consensual close approaches, no deliberate creation of long-lived debris
- UNGA 76/231: Dec. 2021
 - Created an [Open-Ended Working Group](#) to meet four times over 2022 and 2023
 - Goal: develop recommendations on possible norms, rules, and principles of responsible behaviors relating to threats by States to space systems



UN OEWG on Space Threats

- Provided copies of our counterspace report to all delegations
- Co-sponsored regional workshops in Korea (May) and Chile (August)
- Encouraging countries to support DA-ASAT moratorium





Focus on DA-ASAT Testing

- ASAT tests to date have left thousands of pieces of debris in orbit
- 1959-1995, US and USSR did more than a dozen destructive ASAT tests in space, created 1200 pieces of debris, 400 of which are still in orbit)
- Since 2005, US, Russia, China, and India have done 5 destructive ASAT tests in space, creating over 5,300 pieces of trackable debris



Orbital debris from DA-ASAT Tests

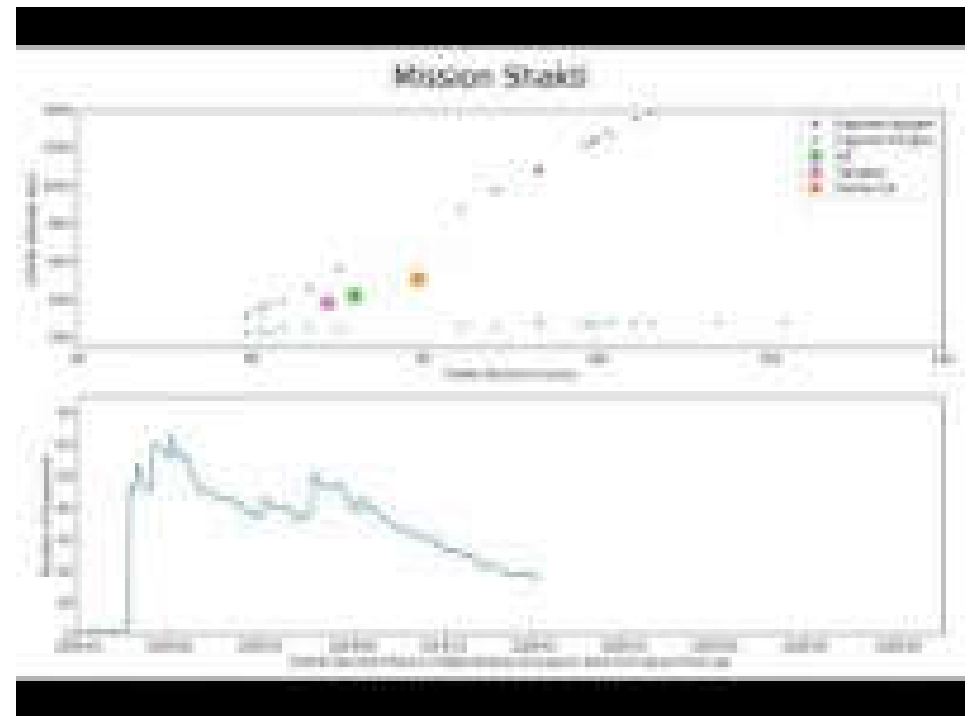
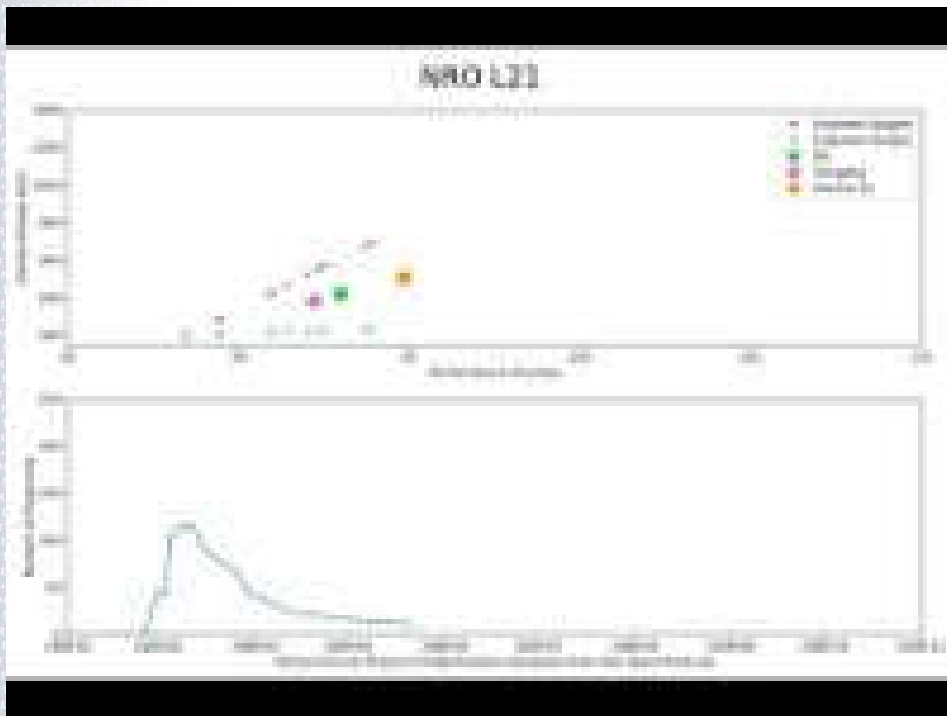
Orbital Debris Created by DA-ASAT Tests in Space

Date	Country	ASAT System	Target	Intercept Altitude	Tracked Debris	Debris Still on Orbit	Total Debris Lifespan
Sept. 13, 1985	U.S.	ASM-135	Solwind	530 km	285	0	18+ years
Jan. 11, 2007	China	SC-19	FengYun 1C	880 km	3527	2763	15+ years
Feb. 20, 2008	U.S.	SM-3	USA 193	220 km	174	0	1+ year
Mar. 27, 2019	India	PDV-MK II	Microsat-R	300 km	128	1	2+ years
Nov. 15, 2021	Russia	Nudol	Cosmos 1408	470 km	1402	1225	Unknown
				Total	6349	4379	

*updated Feb 2022



Orbital debris from ASAT tests





DA-ASAT Testing Moratorium

- International support growing for a moratorium on destructive DA-ASAT tests
 - 18 government responses to UNGA 75/36 included deliberately creating debris/holding ASAT tests as irresponsible behavior
- In April 2022, U.S. announced it was putting in place a voluntary moratorium on destructive DA-ASAT testing
 - New Zealand, Canada, South Korea, Japan, Germany, United Kingdom, Switzerland, Australia, and France have also announced since
- In Dec 2022, the UNGA overwhelming passed resolution A/C.1/77/L.62 in support of a moratorium on destructive DA-ASAT testing



UNGA Resolution

Item 97 - A/77/383 DR II | Destructive direct-ascent anti-satellite missile testing

English

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AGAINST: 9

ABSTENTION: 7

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20



Open Challenges

- US, Russia, China, and India are all pursuing DA-ASATs for different reasons
 - Russia: prevent US space-based missile defense from undermining nuclear deterrent
 - China: deter US from interfering in its backyard by holding US ships at risk
 - US: counter Chinese ISR/ASBMs to enable the US to operate in First Island Chain
 - India: Be seen as a space power & get a seat at the table
- Linkage between space arms control, missile defense, and nuclear stability
- Challenges in defining what a “space weapon” is
 - Current movement to shift to controlling actions/behavior instead of things
- Verification regime?
 - SSA could be the foundation, but a lot more work needs to be done



Save the Date for the Summit for Space Sustainability!



- Only annual conference dedicated exclusively to space sustainability
- Location: Convene, 117 West 46th Street, New York City
- 400 in-person & 200+ online participants expected
- A mix of participatory panels, spotlight talks, keynotes, and special sessions aimed at young professionals
- Register at [SWFsummit.org](https://www.swfsummit.org)

Discussion

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