

Counterspace Capabilities And How to Mitigate Them

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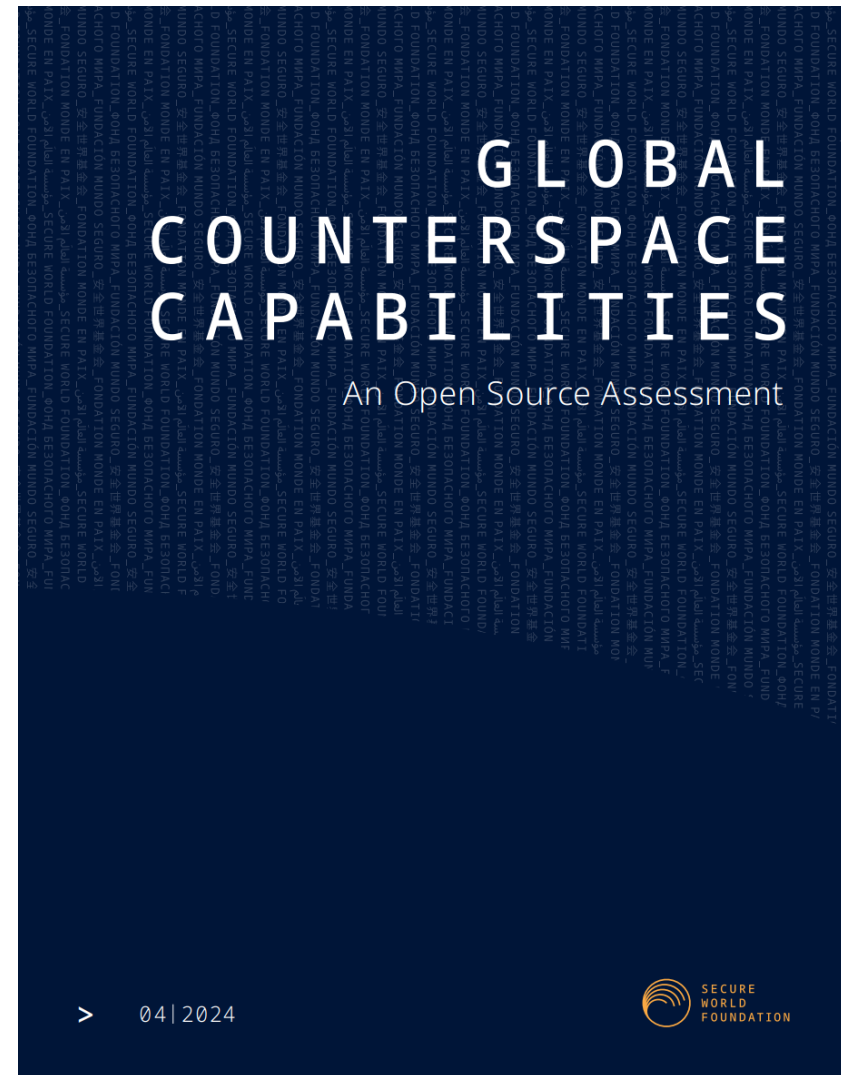


About Secure World Foundation

- **SWF** is a *private 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:** Work 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



- Existence of counterspace capabilities is not new, but the circumstances surrounding them are
- Significant R&D/testing of a wide range of destructive and non-destructive counterspace capabilities by multiple countries
- ***Only non-destructive capabilities are actively being used in current military operations***



<https://swfound.org/counterspace>



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



2024 Global Assessment

	US	Russia	China	India	Aus.	France	Iran	Israel	Japan	North Korea	South Korea	UK
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 ▲



ASAT Tests by Year (2024)

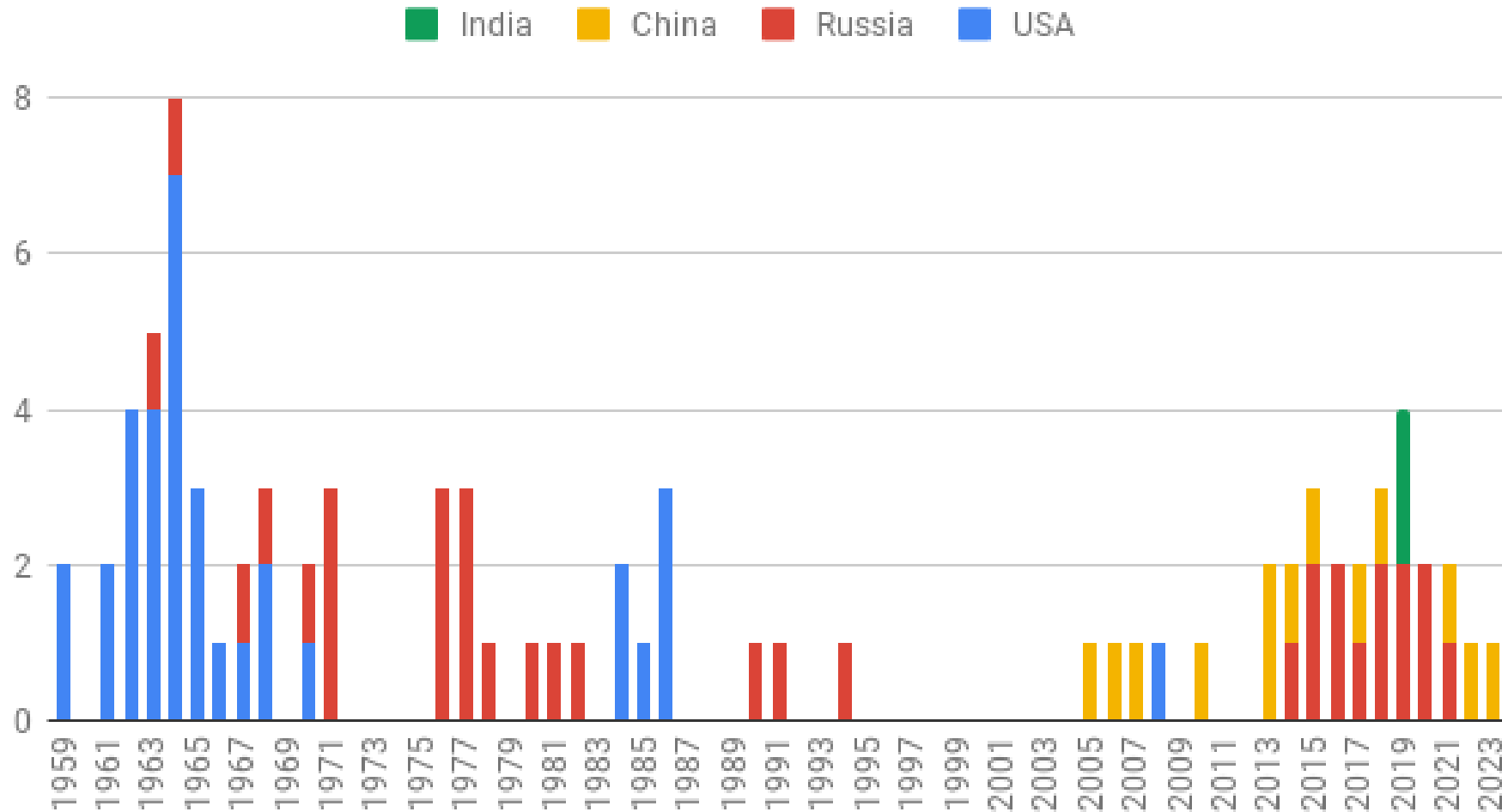
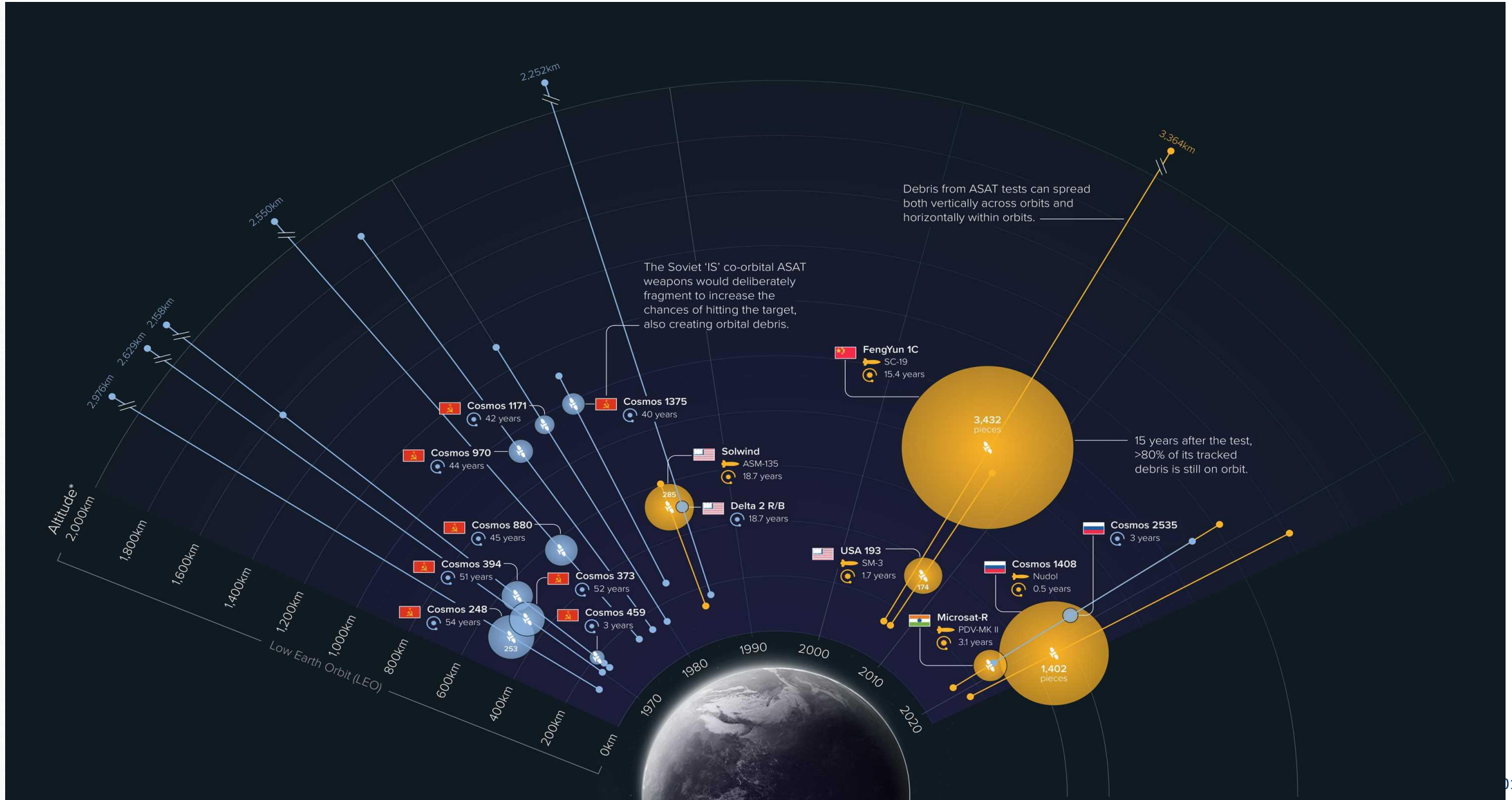




TABLE 5-1 – ORBITAL DEBRIS CREATED BY ASAT TESTS IN SPACE

DATE	COUNTRY	ASAT SYSTEM	TARGET	INTERCEPT ALTITUDE	TRACKED DEBRIS	DEBRIS STILL ON ORBIT	TOTAL DEBRIS LIFESPAN
Oct. 20, 1968	Russia	IS	Cosmos 248		252	76	50+ years
Oct. 23, 1970	Russia	IS	Cosmos 373		147	35	50+ years
Feb. 25, 1971	Russia	IS	Cosmos 394		118	45	50+ years
Dec. 3, 1971	Russia	IS	Cosmos 459		28	0	3.3 years
Dec. 17, 1976	Russia	IS	Cosmos 880		127	56	45+ years
May 19, 1978	Russia	IS-M	Cosmos 970		71	64	40+ years
Apr. 18, 1980	Russia	IS-M	Cosmos 1171		45	5	40+ years
Jun. 18, 1982	Russia	IS-M	Cosmos 1375		63	59	35+ years
Sept. 13, 1985	U.S.	ASM-135	Solwind	530 km	287	0	18+ years
Sept. 5, 1986	U.S.	Delta 180 PAS	Delta 2 R/B		18	0	< 1 year
Dec. 26, 1994	Russia	Naryad-V?	Unknown		27	24	25+ years
Jan. 11, 2007	China	SC-19	FengYun 1C	880 km	3536	2686	15+ years
Feb. 20, 2008	U.S.	SM-3	USA 193	220 km	175	0	1+ year
Mar. 27, 2019	India	PDV-MK II	Microsat-R	300 km	130	0	3+ years
Aug.-Dec. 2019	Russia	Cosmos 2535	Cosmos 2536		30	14	3+ years
Nov. 15, 2021	Russia	Nudol	Cosmos 1408	470 km	1807	67	Unknown
Total					6863	3133	





State of Multilateral Security Discussions (1)

- No forward movement on space security and stability discussions at the UN for decades
 - Disagreement on nature of the threat and how to respond
 - Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (PPWT) / No First Placement (NFP) versus nothing
 - EU Draft Code of Conduct
 - 2013 Group of Governmental Experts (GGE) on TCBMs
 - 2019 GGE on prevention of an arms race in outer space (PAROS)
- UNGA 75/36: Dec. 2020
 - National submissions to the UNSG on nature of the threat to space, responsible/irresponsible behavior, and possible paths forward
 - See some commonalities emerge: 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: come up with recommendations on possible norms, rules, and principles of responsible behaviors relating to threats by States to space systems



State of Multilateral Security Discussions (2)

- Open-ended Working Group (OEWG) on Reducing Space Threats through Norms, Rules, and Principles of Responsible Behaviours
 - Met four times from May 2022 to August 2023; 70 countries participated plus civil society
 - See convergence on many issue areas, including avoiding deliberate creation of debris, need for rules on actions (notifications, consultations) prior to conducting rendezvous and proximity operations, value of TCBMs
- UNGA 77/41: Dec. 2022
 - Calls upon nations to make the commitment not to conduct destructive DA-ASAT missile tests; 155-9-9
- UNGA 77/42: Dec. 2022
 - Calls for no first placement of weapons in outer space; 123-50-3
- UNGA 77/250: Dec. 2022
 - Calls for a GGE to consider and make recommendations on substantial elements of an international legally binding instrument on PAROS (including the prevention of placement of weapons in outer space); 115-47-7
 - Met in November 2023 and finishing up August 2024



Tools for Improving Communication, Transparency

- ***Lexicon for Outer Space Security*** (<https://unidir.org/publication/lexicon-outer-space-security>)
 - Intended to facilitate shared understandings of key topics and terms
 - Three types of terms:
 - Acronyms
 - Common definitions
 - Terminology frequently used in space security discussions that could benefit from further clarification
- ***Space Security Portal*** (<https://spacesecurityportal.org/>)
 - Interactive map of global space governance landscape
 - Seeks to support informed participation by interested stakeholders and support transparency, information-sharing, and capacity-building



Destructive DA-ASAT Missile Test Moratorium

- April 2022: United States made a commitment not to conduct destructive direct-ascent anti-satellite missile tests, has since been joined by 36 more countries
- Driven partially by November 2021 Russian DA-ASAT test
 - DA-ASAT tests have created some of the largest increases in space debris in the last two decades and have made operating in LEO more dangerous for years to come
- UNGA Resolution 77/41 in December 2022 supporting this moratorium (passed 155-9-9)
 - Brazil was a co-sponsor
- Becoming prevalent in multilateral discussions about responsible behavior in space
 - Many countries feel it is irresponsible to deliberately create debris on orbit
- DA-ASATs are unlikely to be useful as military weapons



Why a DA-ASAT Missile Test Moratorium Matters

- Destructive ASAT tests create debris that poses a direct threat to future economic activity in space, particularly LEO
 - Raises the costs and uncertainty of operating there
- Debris is agnostic in terms of whose satellites it threatens: it does not matter if the country who held the test is a geopolitical ally or not
- Debris from Russia's November 2021 ASAT test created "conjunction squalls"
 - Affected remote sensing satellites in sun-synchronous LEO
 - Also many close approaches with Starlink satellites
- Helps build towards international consensus on this and to create a stigma against their use in peacetime
- SWF coordinated an industry statement in support of the DA-ASAT missile test moratorium
 - Currently have 49 signatories from 14 countries
 - For more information, please visit: <https://swfound.org/industryasatstatement/>

Space Industry Statement in Support of International Commitments Not To Conduct Destructive Anti-Satellite Testing

SIGNATORY COMPANIES



Aadi Space
(USA)

amazon | project kuiper

Amazon's Project Kuiper
(USA)



Astroscale
(Japan)



Atomos Space
(USA)

AXELSPACE

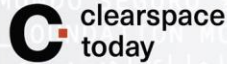
Axelspace Corporation
(Japan)



Axiom Space, Inc.
(USA)



Charter
(USA)



ClearSpace
(Switzerland)



COMSPOC Corporation
(USA)



D-Orbit
(Italy)

DIGANTARA

Digantara
(India)



ENPULSION GmbH
(Austria)



Eutelsat Group
(France)



Exolaunch
(Germany)



ExoAnalytic Solutions
(USA)



Exotrail
(France)



GHGSat
(Canada)



GMV
(Spain)



Green Orbit Digital Ltd
(UK)



HawkEye 360, Inc.
(USA)



Iridium Communications Inc.
(USA)



Kall Morris Inc
(USA)



Kayhan Space
(USA)



LeoLabs
(USA)



LifeShip
(USA)



Look Up Space
(France)



Lumi Space
(UK)



Neuraspace
(Portugal)



NorthStar Earth & Space
(Canada)



Obruta Space Solutions
(Canada)

OKAPI ORBITS

OKAPI:Orbits
(Germany)



Orbit Fab Ltd
(UK)



Planet
(USA)



Privateer Space, Inc.
(USA)



Protean Robotics
(USA)



Rogue Space Systems Corporation
(USA)



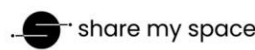
Satsearch
(Netherlands)



SCOUT Space Inc.
(USA)



Seraphim Space Manager LLP
(UK)



Share My Space
(France)



Slingshot Aerospace
(USA)



SpaceLocker
(France)



Space Industry Association of Australia
(Australia)



SpaceWatch.Global
(Germany)



Spire Global
(USA)



ThinkTank Maths Limited
(UK)



UARX Space
(Spain)



Voyager Space
(USA)



World Geospatial Information Council
(Netherlands)

Questions?

Thanks.

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