Space Security and Challenges to International Stability

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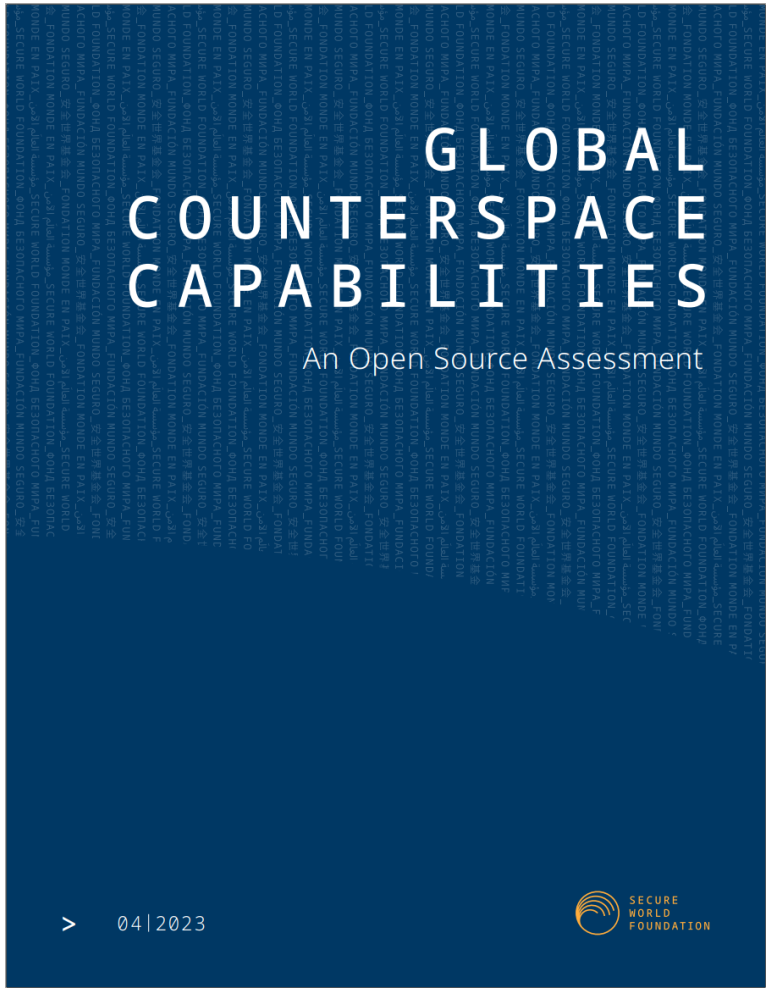
SECURE
WORLD
FOUNDATION

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: 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

- Existence of counterspace capabilities is not new, but the circumstances surrounding them are
- Significant R&D/testing of a wide range of destructive & 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;

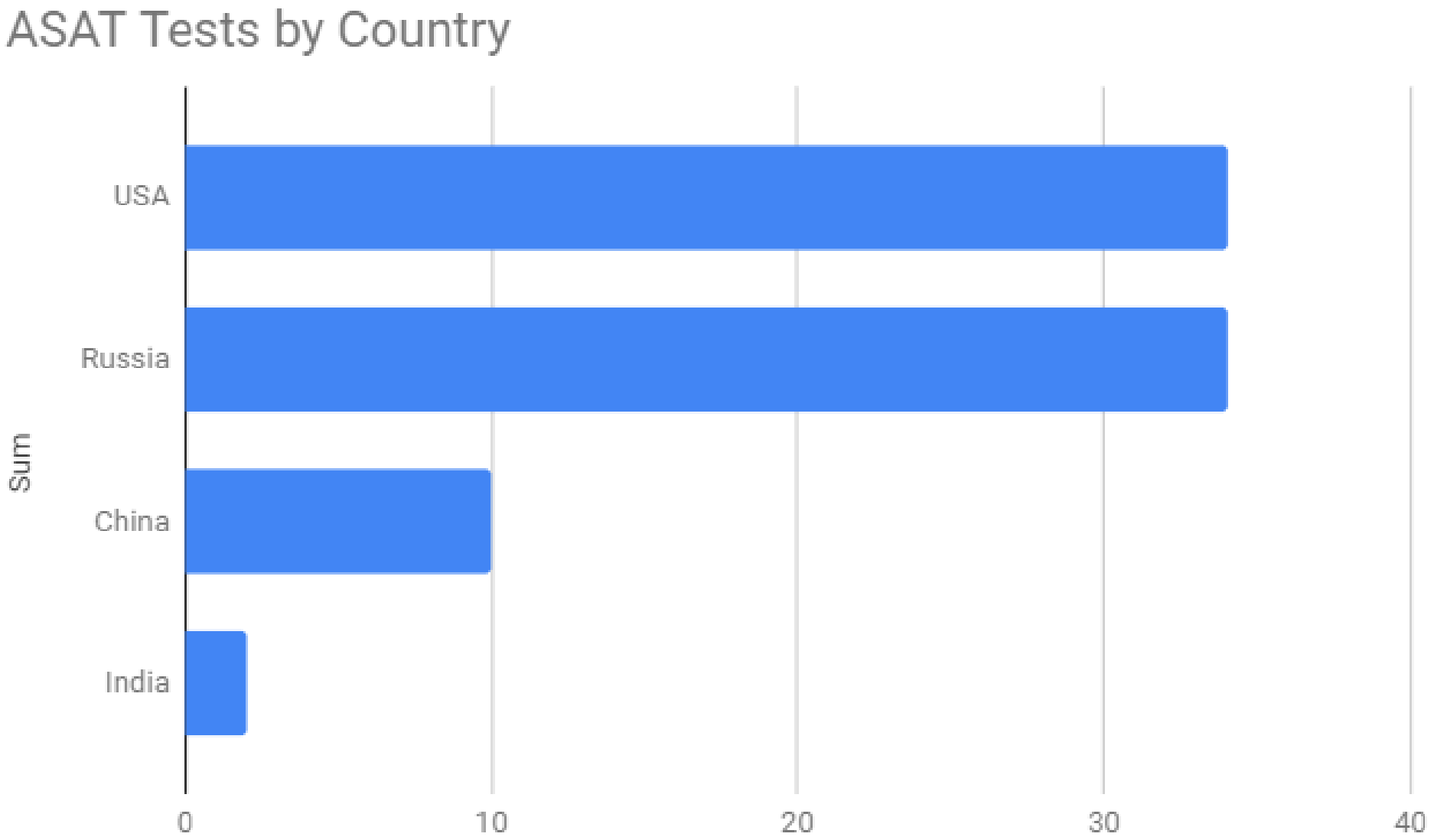
Cyber: weapons that use software and network techniques to compromise, control, interfere, or destroy computer systems.

Space Situational Awareness: knowledge about the space environment and human space activities that enables both offensive and defense counterspace operations

2023 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 ▲


ASAT Tests by Country
USA
Russia
China
India
Sum
0
10
20
30
40

ASAT Tests by Year

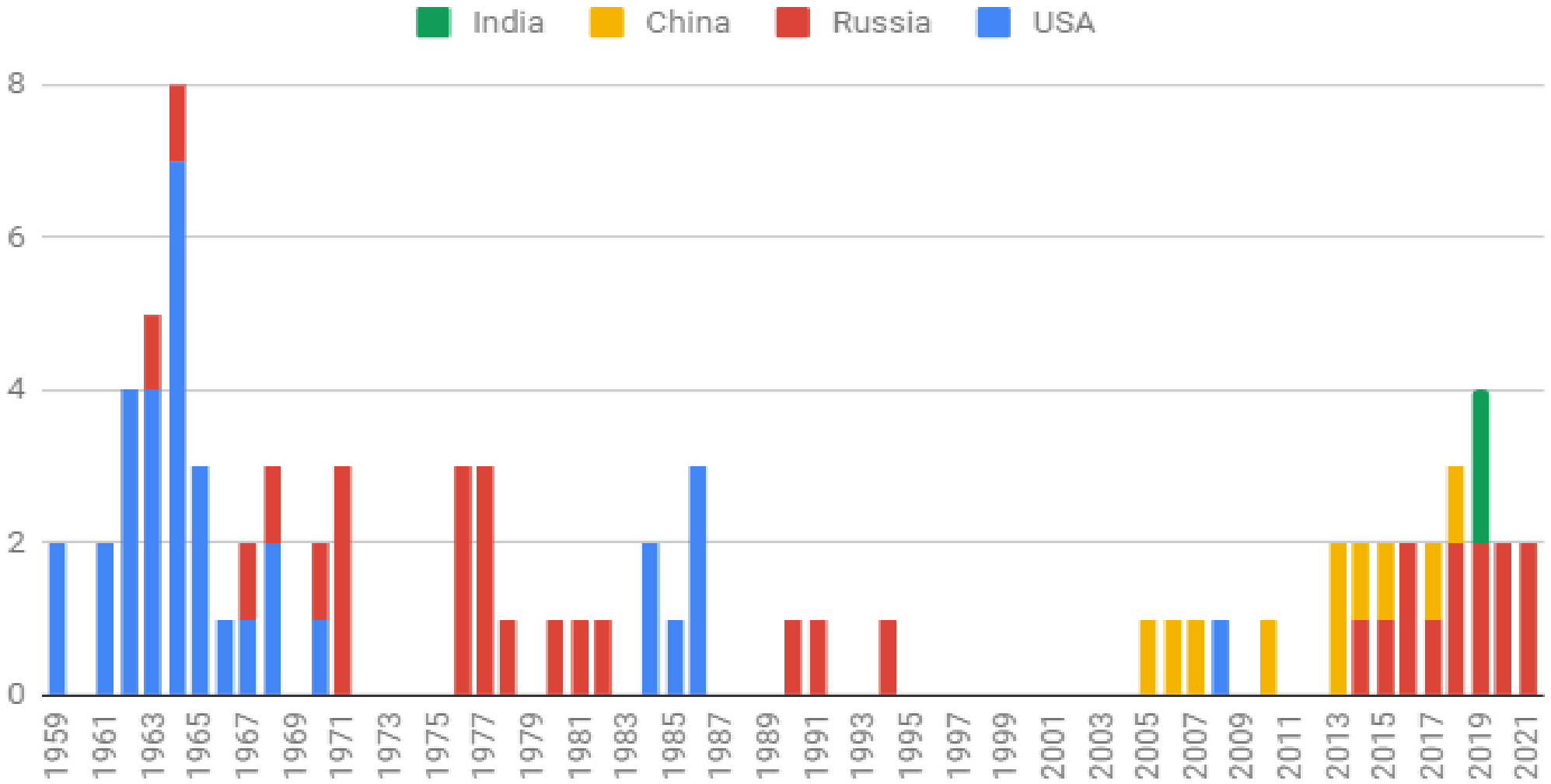
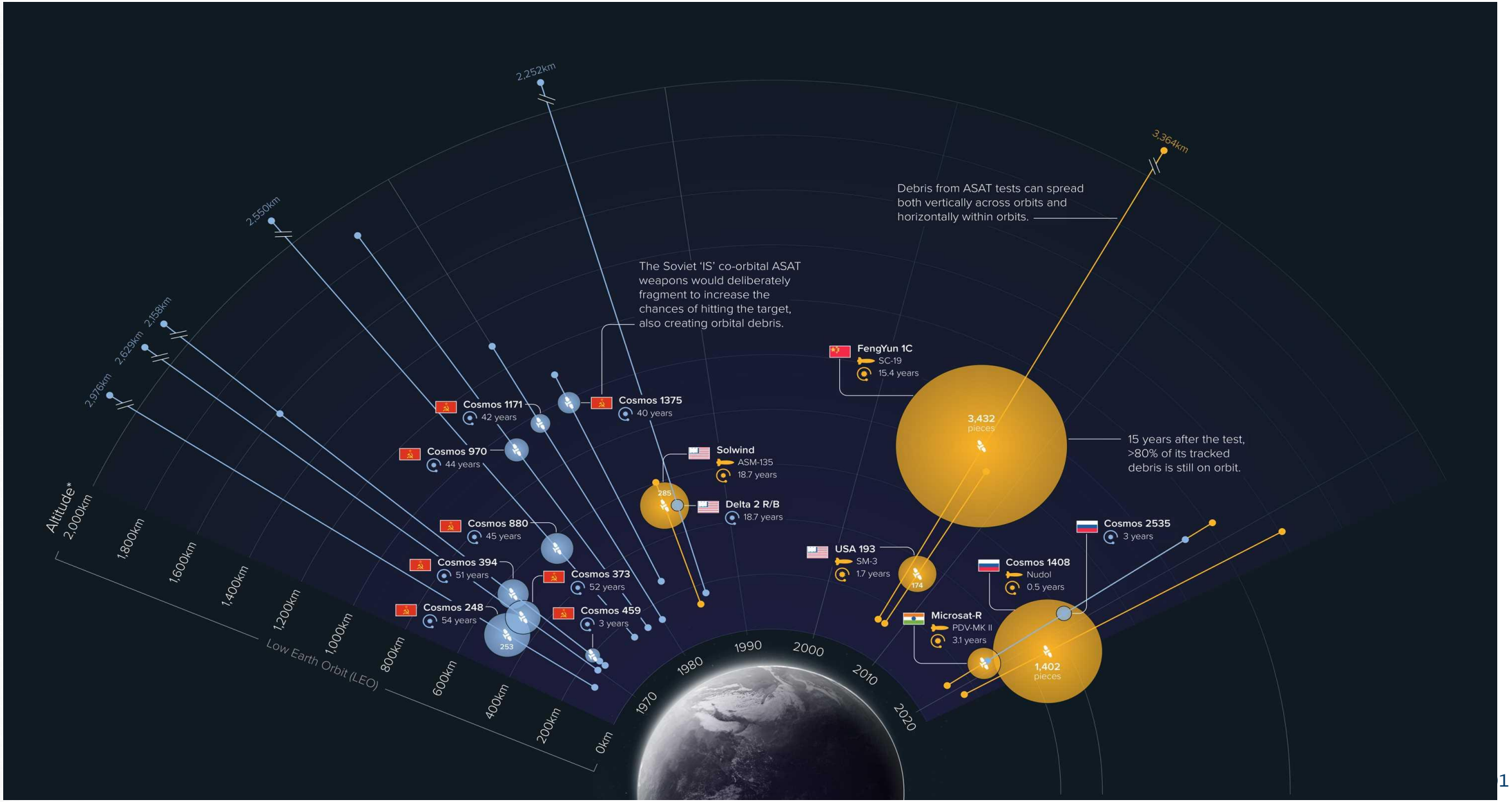


TABLE 5-1 – ORBITAL DEBRIS CREATED BY ASAT TESTS IN SPACE

DATE	COUNTRY	ASAT SYSTEM	TARGET	INTERCEPT ALTITUDE	TRACKED DEBRIS	DEBRIS STILL ON ORBIT	TOTAL DEBRIS LIFESPAN
Oct. 20, 1968	Russia	IS	Cosmos 248		252	79	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		29	0	3.3 years
Dec. 17, 1976	Russia	IS	Cosmos 880		127	57	45+ years
May 19, 1978	Russia	IS-M	Cosmos 970		73	64	40+ years
Apr. 18, 1980	Russia	IS-M	Cosmos 1171		48	6	40+ years
Jun. 18, 1982	Russia	IS-M	Cosmos 1375		64	60	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		17	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	2786	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	1	3+ years
Aug.-Dec. 2019	Russia	Cosmos 2535	Cosmos 2536		30	16	3+ years
Nov. 15, 2021	Russia	Nudol	Cosmos 1408	470 km	1790	300	Unknown
				Total	**6850**	**3472**	


2,252km
3,364km
2,550km
2,158km
2,629km
2,976km
Debris from ASAT tests can spread both vertically across orbits and horizontally within orbits.
The Soviet 'IS' co-orbital ASAT weapons would deliberately fragment to increase the chances of hitting the target, also creating orbital debris.
FengYun 1C
SC-19
15.4 years
3,432 pieces
15 years after the test, >80% of its tracked debris is still on orbit.
Cosmos 1171
42 years
Cosmos 1375
40 years
Cosmos 970
44 years
Solwind
ASM-135
18.7 years
285
Delta 2 R/B
18.7 years
Cosmos 880
45 years
Cosmos 394
51 years
Cosmos 373
52 years
Cosmos 248
54 years
253
Cosmos 459
3 years
USA 193
SM-3
1.7 years
174
Cosmos 2535
3 years
Cosmos 1408
Nudol
0.5 years
Microsat-R
PDV-MK II
3.1 years
1,402 pieces
Altitude*
2,000km
1,800km
1,600km
1,400km
1,200km
1,000km
800km
600km
400km
200km
0km
Low Earth Orbit (LEO)
1970
1980
1990
2000
2010
2020

Close Approaches and Effects on Space Stability

- Uncoordinated close approaches: potential for (inadvertent) escalation
- Not as easy to make hard and fast requirements about
- Different risk assessments by different actors in space
- Very few hard “rules” about what is and isn’t allowed
  - Intent is key – how do you demonstrate intent?
  - Need for rules of the road: right of way, ways to quickly communicate amongst actors, IncSea for space?
  - Role of space situational awareness and its limitations

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

- 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 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
  - Will meet for two weeks November 2023 and July 2024

Responsible behavior in space

- Just wrapped up two-year process of UN Open-ended Working Group on Reducing Space Threats
  - Success? Yes and no

- Interest converging 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

- Jessica West (Ploughshares) analysis of types of recommendations for responsible behavior: operating with due regard, sharing information, avoid contamination of space environment, avoid harmful interference, non-use of force

Case Study: ASAT Test Moratorium

- Dangerous nature of space debris to satellites, humans in orbit
  - ~8900 active satellites; ~48,000 pieces of debris we can track, ~900,000 pieces big enough to cause damage but too small to track
  - ASAT tests leave debris in orbit
  - At present, no way to deliberately get rid of debris (remediation)

- International support growing for an ASAT test moratorium
  - Increasingly see the deliberate creation of debris/holding destructive ASAT tests as irresponsible behavior
  - In April 2022, the United States announced it was making a commitment not to conduct destructive direct-ascent anti-satellite missile tests
    - 35 countries now have made this commitment
  - UNGA Resolution 77/41 called for same commitment
  - Underlines focus on behavior, not necessarily technologies
  - Aided by dwindling military utility of DA-ASAT tests

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

Congestion On and Around the Moon

- 106 cislunar and lunar missions by 19 countries and one multilateral organization (ESA)
- Activities on the Moon are changing
- Artemis Accords vs International Lunar Research Station?
- Complications on Earth replicating on the Moon?

Questions?

Thanks.

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