



Promoting Cooperative Solutions for Space Sustainability

Russia's ASAT Test: What Does it Mean?

Friday, April 24, 2020
10:30a – 12:00p EDT

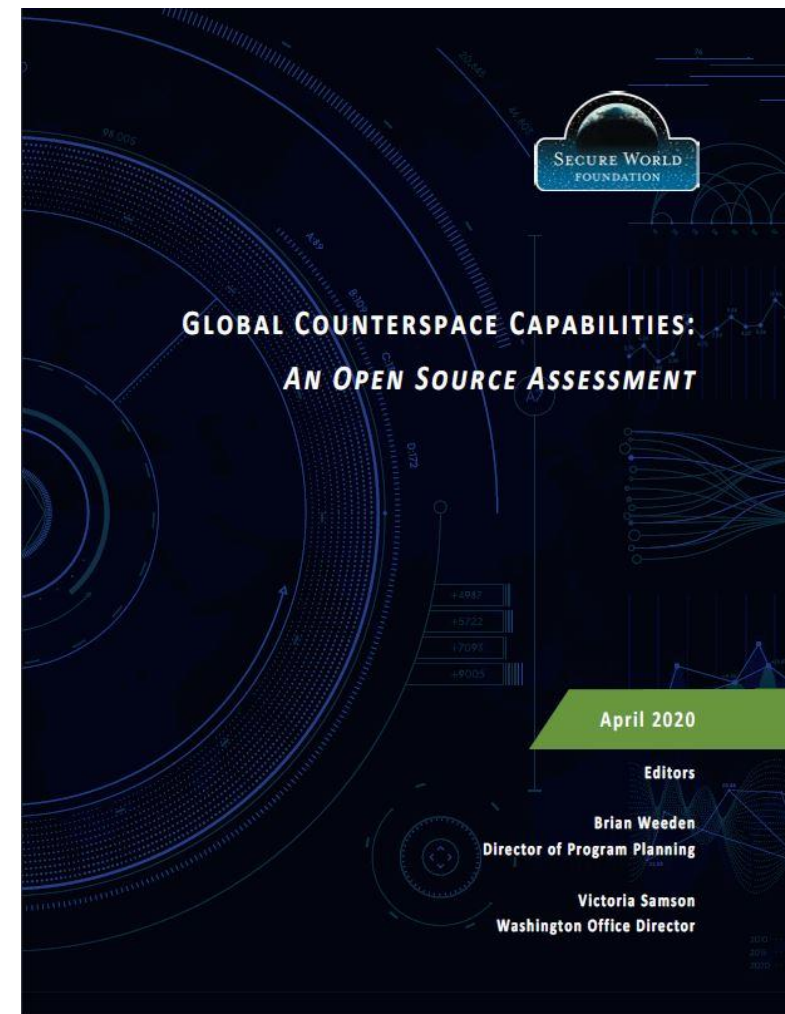


Promoting Cooperative Solutions for Space Sustainability

About 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

- SWF's Global Counterspace Capabilities: An Open Source Assessment
 - Significant research and development of a broad range of kinetic (i.e. destructive) and non-kinetic counterspace capabilities in multiple countries: direct ascent, co-orbital, electronic warfare, directed energy, cyber
 - US, Russia, China, France, India, Iran, Japan, North Korea
 - Only non-kinetic capabilities are actively being used in current military operations
- <https://swfound.org/counterspace>



Intro

10 min panelist presentations

Q & A



Victoria Samson

Secure World
Foundation

@Vsamson_DC



Brian Weeden

Secure World
Foundation

@brianweeden



Michael Thompson

Amateur Satellite
Analyst

@M_R_Thomp



Pavel Podvig

Russian Nuclear
Forces Project

@russianforces

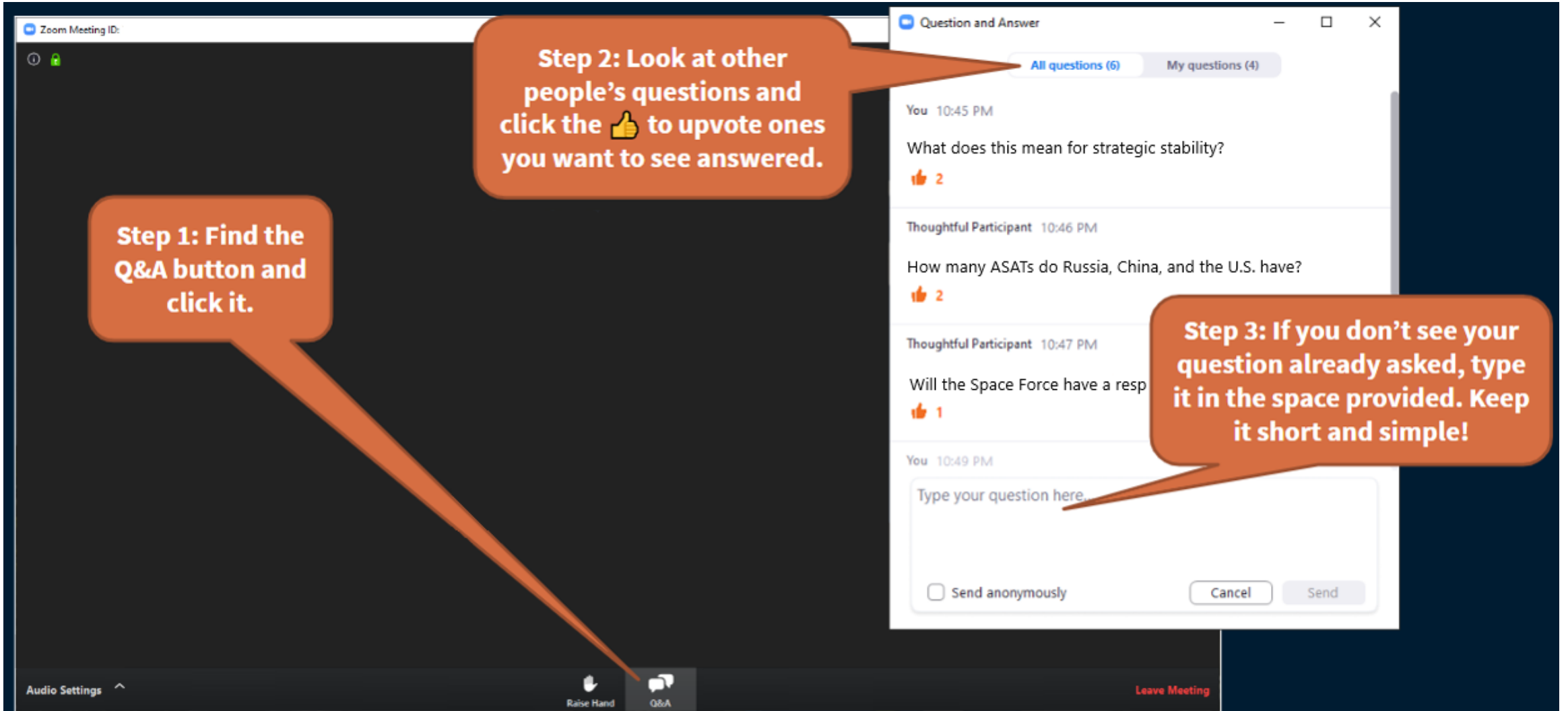


Chris Newman

Northumbria
University

@ChrisNewman1972

How to ask Questions



The image shows a Zoom meeting interface with a 'Question and Answer' panel open. Three orange callout boxes provide instructions:

- Step 1:** Find the Q&A button and click it. (Points to the 'Q&A' button in the Zoom meeting toolbar.)
- Step 2:** Look at other people's questions and click the thumbs up icon to upvote ones you want to see answered. (Points to the thumbs up icon next to a question.)
- Step 3:** If you don't see your question already asked, type it in the space provided. Keep it short and simple! (Points to the text input field in the 'Question and Answer' panel.)

The 'Question and Answer' panel shows a list of questions:

- You 10:45 PM: What does this mean for strategic stability? (2 upvotes)
- Thoughtful Participant 10:46 PM: How many ASATs do Russia, China, and the U.S. have? (2 upvotes)
- Thoughtful Participant 10:47 PM: Will the Space Force have a resp (1 upvote)
- You 10:49 PM: (Input field with placeholder text 'Type your question here.', 'Send anonymously' checkbox, 'Cancel' button, and 'Send' button)



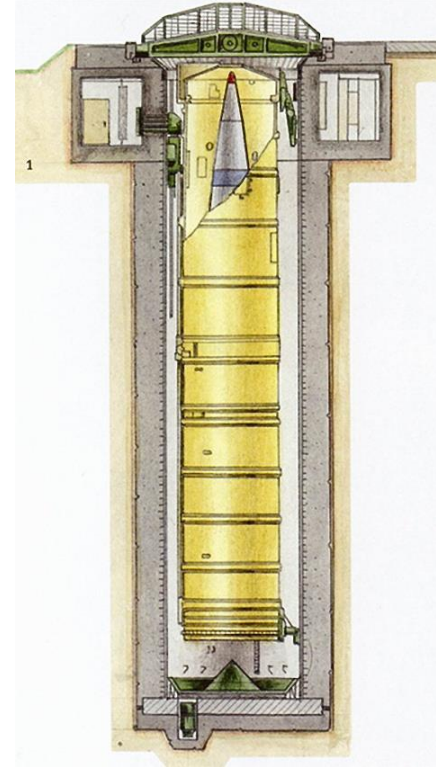
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Background on Nudol and Russian Counterspace Programs

Dr. Brian Weeden

Russian DA-ASAT Background

- Soviet A-135 missile defense system likely had DA-ASAT capability
- 51T6 (SH-11 “Gorgon”) silo-based missile had nuclear payload and could probably target LEO
- 51T6 was first deployed in 1992 and retired in 2007
- Work underway on upgraded A-235 system and 53T6 replacement for the Gazelle



Drawing of 51T6 silo
Image credit: [Air Power Australia](#)

Nudol Development

- August 2009 contract with PVO Almaz-Antey for PL-19 Nudol
 - Subs to OKB Novator, KB Tochmash, and Moscow Institute for Thermal Technology
- Initial non-flight test in 2013
- TEL-based mobile solid rocket with interceptor payload
 - 14A042 rocket
 - 14P078 C2 system
 - 14TS031 radar



*Artist's depiction from company calendar.
Image credit: Almaz-Antey*

Comparison to US/China DA-ASAT



Russian PL-19
Image credit: Almaz-Antey



Chinese DF-21C
Image credit: [Air Power Australia](#)























American SM-III
Image credit: [U.S. Navy](#)



Indian PDV Mk II
Image credit: DRDO

System	Country	Basing Mode	Tested Against Satellite	Deployed
PL-19	Russia	TEL	No	No
SC-19	China	TEL	Yes	Likely
SM-III	United States	Ship	Yes*	Yes*
PDV Mk II	India	Silo	Yes	No

Russia Overall 2020 Assessment

	R&D	Testing	Operational	Use in Conflict
LEO Direct Ascent			-	
MEO/GEO Direct Ascent		-	-	
LEO Co-Orbital			-	
MEO/GEO Co-Orbital		-	-	
Directed Energy			?	
Electronic Warfare				
Space Situational Awareness				?

Legend: none  some  significant  uncertain "?" no data "-"



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April 2020 Nudol Test Analysis of Navigation Warnings

Mr. Michael Thompson

Navigation Warnings

- Standard airspace/maritime closures for any number of reasons
 - Military activities
 - Surveying
 - **Rocket launches**
- Allows us to identify these tests before they happen (6 days in this case)

Navigation Warnings for Nudol

- **Every known Nudol test** has put out navigation warnings multiple days in advance
- Constrains first stage and eventual splashdown



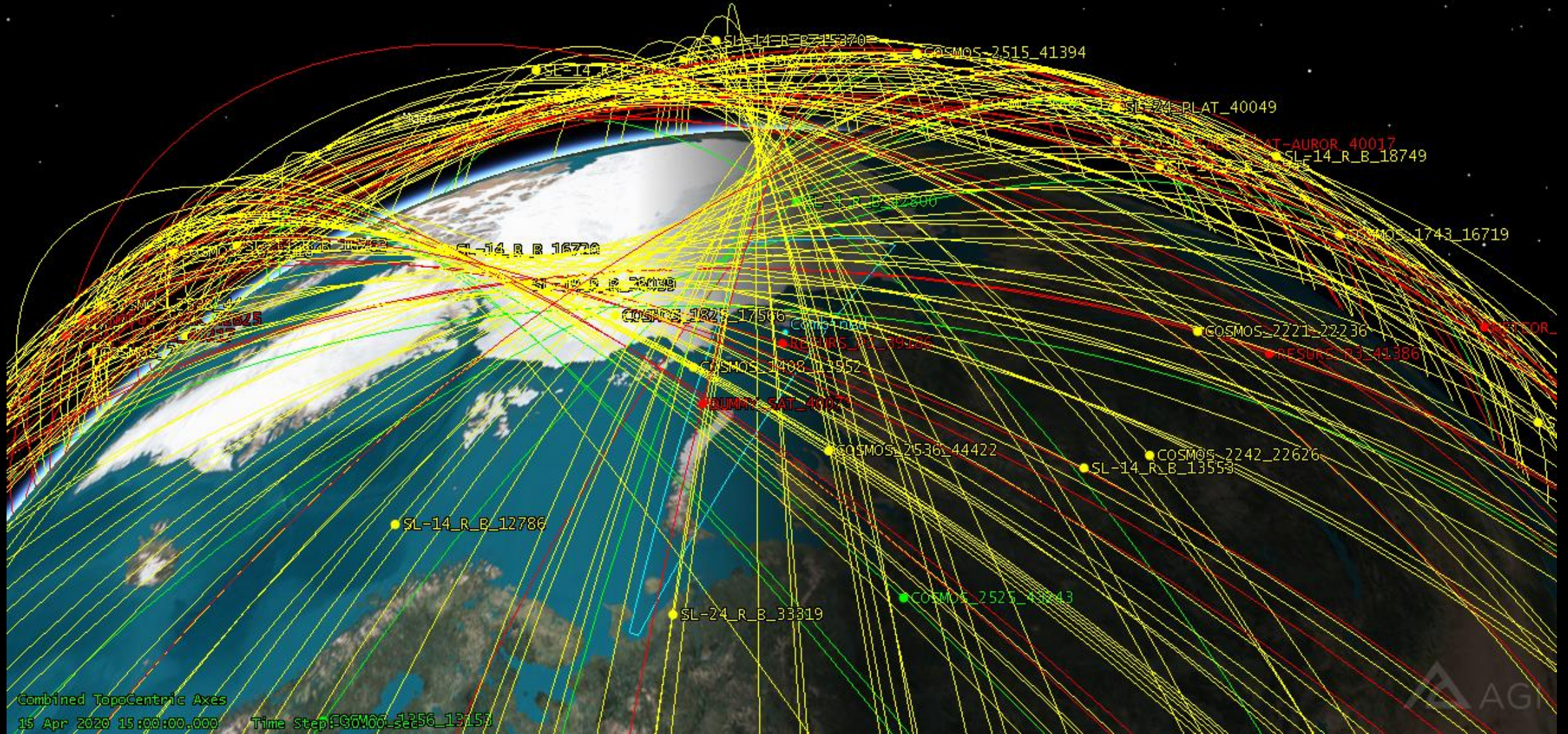
Constraining Potential Targets

- Likely little to no difference in navigation warnings for flight tests vs a potential kinetic test
- Can analyze objects in orbit to attempt and spot a kinetic test before it happens

April 15th Test

- Navigation Warnings constrain timing and location of test
 - 15:00 UTC – 21:00 UTC
 - Plesetsk
- Based on this timing, we can (relatively) quickly constrain a list of possible targets
- An isolation of every Russian satellite that passes through an area that combines the first stage and splashdown warnings yields...

...A Lot of Potential Targets



- What types of objects are likely to be ASAT test targets?
 - Low-altitude objects
 - Dead or recently launched satellites with unknown functions
 - MICROSAT-R (likely a dedicated target)
 - USA-193 (malfunctioning and decaying)
 - FY-1C (dead)
- Using essentially common sense as to what might be a target, you can vastly narrow the potential targets...

...A Much More Manageable Scenario



April 15th Test

- Highlights from target search:
 - Cosmos 2535 – 2538
 - Quartet of satellites from late 2019 of unknown function
 - Some speculation that 2537 and 2538 are radar calibration targets
 - Quite high for a potential ASAT test (~600km)
 - SL-4 Rocket Body (42800)
 - Low Altitude (230km) – Decayed April 20th
 - Geometry travels directly down the firing line, allowing for head-on impact

Object 42800 Encounter



Combined TopoCentric Axes

15 Apr 2020 17:59:00.000

Time Step: 30.00 sec

20



April 15th Test

- Commercial SSA organizations (LeoLabs, others) allow near-real time monitoring of potential targets
- LeoLabs
 - Even without an account, you can monitor when new state vectors are generated based on tracking passes
 - As new state vectors are generated within hours of overflying the test area, you can “cross off” objects

Ultimate Takeaways

- There were potential low-altitude targets that could have been used in this test, but they weren't (which is a good thing!)
- A further narrowing of the time window could likely constrain the parameters of the test much better
- This type of framework using navigation warnings and basic orbital analysis allows us to monitor these tests in near-real time completely at the unclassified/open source level
 - The US military announced this test, previous ones were left unacknowledged



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Geopolitical and Russian Domestic Context

Dr. Pavel Podvig
Russianforces.org

ASAT: Laws, Guidelines and Norms

Professor Chris Newman, PhD, BA(Hons)



**Northumbria
University**
NEWCASTLE



Legality of ASAT Tests

- ASAT tests highlight the intersection between arms control & space governance.
- Both *COPUOS* and *CD* have seen fruitless discussions on ASAT controls.
- OST 1967 characterized primarily as a security treaty and remains the central trunk of international space governance.
- Four major space powers have engaged in ASAT testing



Outer Space Treaty & ASAT Testing

- OST – Predominantly a security treaty establishing key limitations on usage of space for military purposes
- Use of Outer Space for ‘Peaceful Purposes’
- Art IV OST – undertaking not to station nuclear weapons/WMD in orbit
- Art IV does not prohibit the stationing of conventional weapons – including conventional ASAT weapons in space, nor does it explicitly prohibit the testing of weapons in Earth orbit.
- Art IX countries shall ‘conduct their activities in space with due regard for the interests of other parties’



- There is nothing in the OST to prohibit ASAT weapon tests.
- Discussion moved to CD but PAROS and other treaty initiatives have been consistently unsuccessful
- Customary International Law is a possible avenue to restrict the weaponization of space, but *opinion juris* requires general and consistent state practice* and attribution of that behaviour due to a legal obligation

*North Sea Continental Shelf Cases – States having Special Interests



- Four major space powers have conducted/demonstrated ASAT weapons tests causing varying degree of disturbance to the orbital environment.
- Legality aside, states are conducting ASAT tests and it is likely that more will follow.
- Normative behaviour is emerging and ASAT tests are a part of that normative framework.
- Upper altitude limits | Debris mitigation | Notification requirements



Options

- Established legal mechanisms unlikely to inhibit further ASAT weapons tests
- New Treaty? Unlikely (timeliness, international will, definitional issues)
- Softer Agreements? (EU Code of Conduct for Outer Space?)
- Unilateral declarations of guidelines for ASAT tests?



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Questions?