Russia’s ASAT Test: What Does it Mean?

Friday, April 24, 2020
10:30a – 12:00p EDT
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](https://swfound.org/counterspace)
How to ask Questions

Step 1: Find the Q&A button and click it.

Step 2: Look at other people’s questions and click the 👍 to upvote ones you want to see answered.

Step 3: If you don’t see your question already asked, type it in the space provided. Keep it short and simple!
Background on Nudol and Russian Counterspace Programs

Dr. Brian Weeden
• 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
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

<table>
<thead>
<tr>
<th>System</th>
<th>Country</th>
<th>Basing Mode</th>
<th>Tested Against Satellite</th>
<th>Deployed</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL-19</td>
<td>Russia</td>
<td>TEL</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SC-19</td>
<td>China</td>
<td>TEL</td>
<td>Yes</td>
<td>Likely</td>
</tr>
<tr>
<td>SM-III</td>
<td>United States</td>
<td>Ship</td>
<td>Yes*</td>
<td>Yes*</td>
</tr>
<tr>
<td>PDV Mk II</td>
<td>India</td>
<td>Silo</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

*Image credits: Russia’s ASAT Test: what does it mean? April 24, 2020*
### Russia Overall 2020 Assessment

<table>
<thead>
<tr>
<th>Weapon System</th>
<th>R&amp;D</th>
<th>Testing</th>
<th>Operational</th>
<th>Use in Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEO Direct Ascent</td>
<td><img src="green.png" alt="Green" /></td>
<td><img src="yellow.png" alt="Yellow" /></td>
<td>-</td>
<td><img src="red.png" alt="Red" /></td>
</tr>
<tr>
<td>MEO/GEO Direct Ascent</td>
<td><img src="yellow.png" alt="Yellow" /></td>
<td>-</td>
<td>-</td>
<td><img src="red.png" alt="Red" /></td>
</tr>
<tr>
<td>LEO Co-Orbital</td>
<td><img src="green.png" alt="Green" /></td>
<td><img src="yellow.png" alt="Yellow" /></td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td><img src="red.png" alt="Red" /></td>
</tr>
<tr>
<td>Directed Energy</td>
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<td><img src="yellow.png" alt="Yellow" /></td>
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<td><img src="red.png" alt="Red" /></td>
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<tr>
<td>Electronic Warfare</td>
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<td><img src="green.png" alt="Green" /></td>
<td><img src="green.png" alt="Green" /></td>
</tr>
<tr>
<td>Space Situational Awareness</td>
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<td><img src="green.png" alt="Green" /></td>
<td><img src="green.png" alt="Green" /></td>
<td>?</td>
</tr>
</tbody>
</table>

**Legend:**
- none
- some
- significant
- uncertain “?”
- no data “-”
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
• 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
• 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
Geopolitical and Russian Domestic Context

Dr. Pavel Podvig
Russianforces.org
ASAT: Laws, Guidelines and Norms

Professor Chris Newman, PhD, BA(Hons)
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
The Way Forward?

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?
Questions?