

# Space Weapons and the Challenges to Space Security



Dr. Deganit Paikowsky

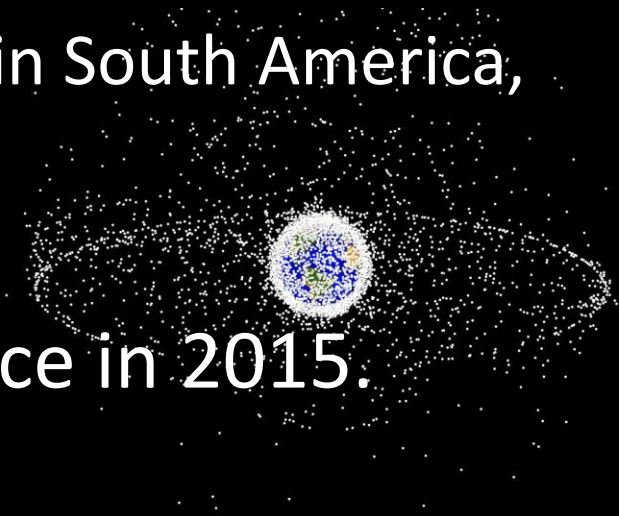
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# Overview

- Global space activity and the need for space security and sustainability
- Threats and challenges to the security of space systems:
  - Unintentional hazards
  - Intentional hazards and space weapons
  - A typology of intentional hazards
- Steps ahead

# Global Space Activity

- 2014 Space Market 330B\$
- About 1200 active and operating satellites
- 10 space launching countries: Russia, USA, European Space Agency, China, Japan, India, Israel, Iran, North-Korea, South-Korea
- About 70 countries own space assets
  - Greater interest in space activity in South America, the Middle East, and Africa
- 80-90 launches a year
- 158 satellites launched into space in 2015.



# What is Space Security and Sustainability?

The ability of all humanity to continue to use outer space for peaceful purposes and socioeconomic benefit over the long term.

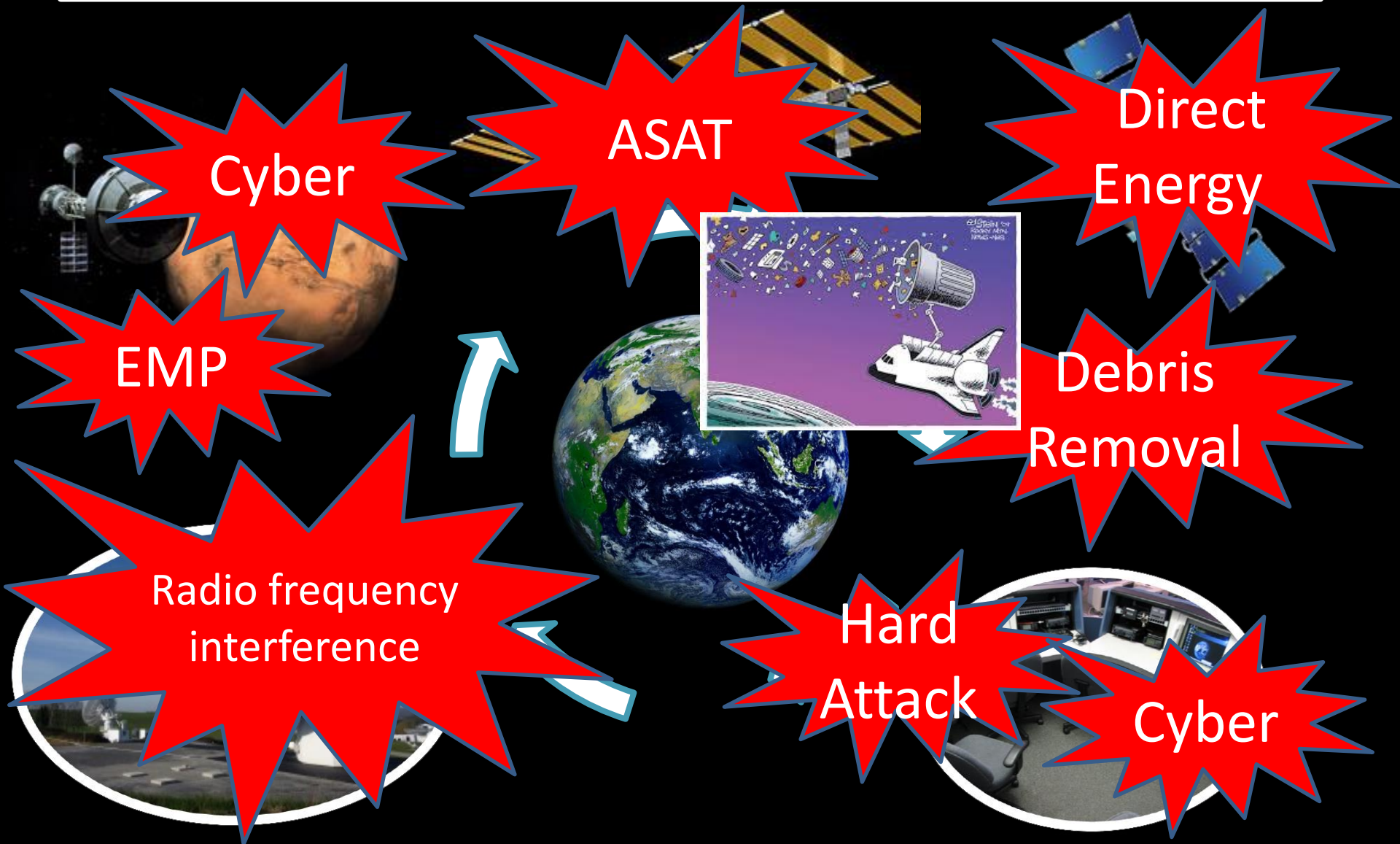


# Challenges of Space Security and Sustainability

- A. Threats from the space environment
- B. Threats originating from human space activity:
  - \* Unintentional hazards
  - \* **Intentional hazards**



# Intentional Hazards and Space Weapons



# A Typology of Intentional Hazards and Space Weapons

1. Soft-kill / Hard kill
2. Denial (Temporary and reversible damage)/  
Destruction (Permanent Damage)
3. Based in space / Based on the ground.

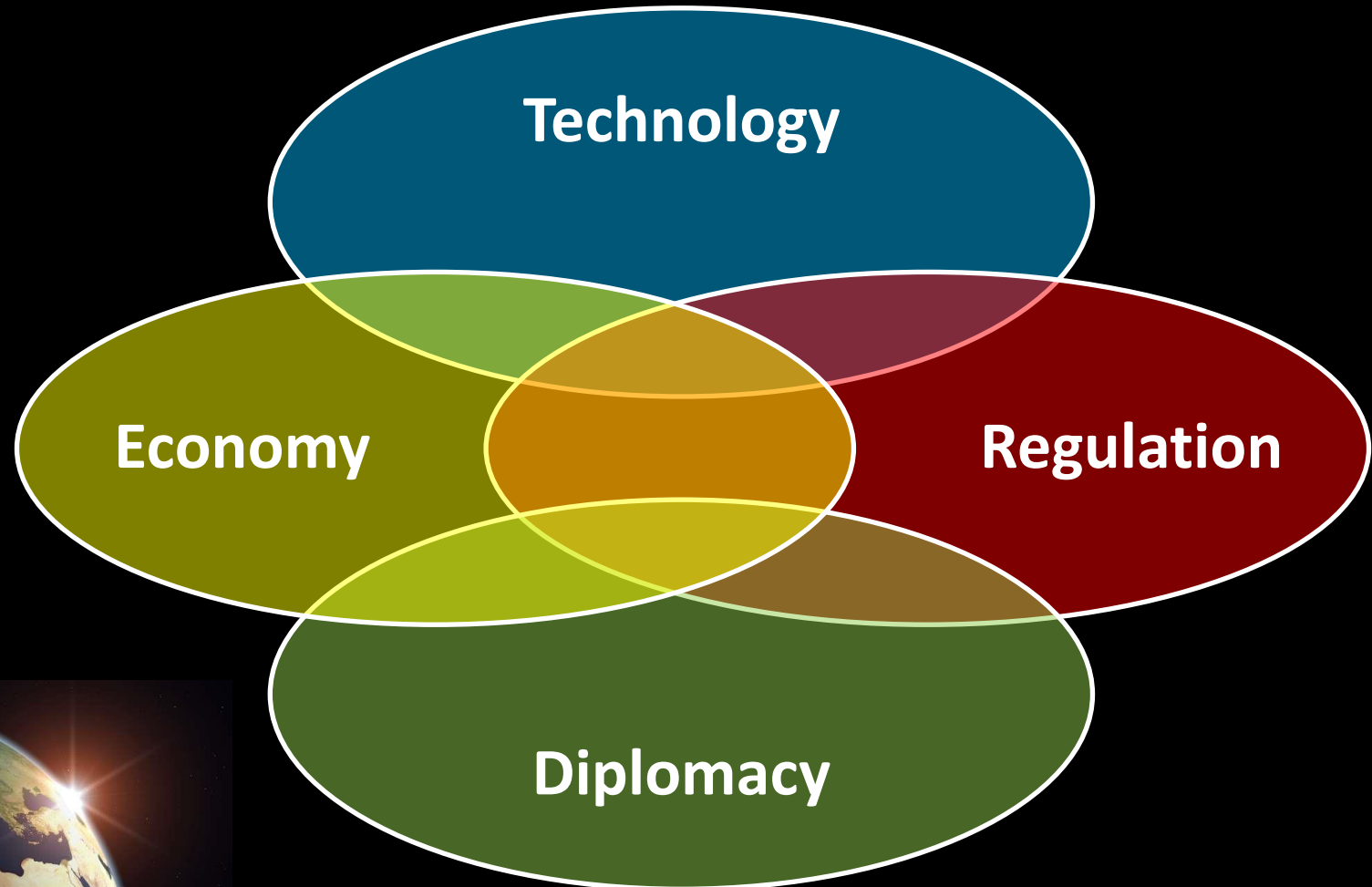
	Temporary/Denial	Permanent/ Destruction
In space	<ol style="list-style-type: none"> <li>1. Direct Energy (DE)</li> <li>2. Cyber</li> </ol>	<ol style="list-style-type: none"> <li>1. High DE</li> <li>2. Cyber</li> <li>3. ASAT- kinetic intercept and close approach</li> <li>4. Debris Removal</li> </ol>
On the ground	<ol style="list-style-type: none"> <li>1. DE</li> <li>2. Cyber</li> <li>3. Radiofrequency interference</li> </ol>	<ol style="list-style-type: none"> <li>1. High DE</li> <li>2. Physical attack of ground stations</li> <li>3. ASAT Missiles - kinetic intercept and close approach</li> </ol>



# Current Status and Use of Space Weapons

- Spacefaring nations reinforcing their defensive capabilities.
- Growth in the number of Jamming events.
- Cyber - An Achilles Heel.
- Direct Energy and Lasers.
- ASATs development and experiments.

# Potential Tools



# Providing Better Protection

- ✓ Greater awareness to the growing threat of space weapons .
- ✓ Adopting a holistic perspective – assuring the sustainability of space systems – instead of the security of a particular space object.
- ✓ Better dialogue among military, civil, and commercial actors.
- ✓ Standardization and regulation at the international and national levels.
- ✓ International cooperation.

# Literature

- The Physics of Space Security (2005)
- Space Security Index 2015 (2015)
- Space 2015: A Year in Review (2016)

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