Trends in National Security Space

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Trends in space security

- Space is becoming more ***globalized***
  - 12 countries have demonstrated indigenous space launch capability (Iran, North Korea, South Korea, and New Zealand are the newest)
  - Private sector now makes up significant portion of space activity
  - Increasing amount of physical and electromagnetic congestion in highly-used orbits and spectrum

- Space security is becoming more ***multidimensional***
  - The space environment (human-generated and natural) poses a significant threat to all space actors
  - Mistakes, mishaps, and misperceptions can be misinterpreted as intentional aggression
  - Increasing reliance on space for national security leads to increased vulnerability

Perception of space threats

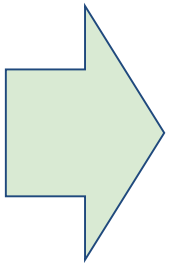
- 1950s – 1980s: Counterspace is the biggest threat
  - Cold War competition between the U.S. and Soviet Union
  - Nearly all the focus was on military threat posed by Soviet space and counterspace capabilities
  - Space environment was a risk, but not focused on

- 1990s – 2000s: Environment is the biggest threat
  - Collapse of the Soviet military threat, and beginning of increased international civil and commercial activity
  - Increased focus on threats of space debris and space weather to satellite operations

Space domain trends

Old Space Paradigm

- National
- Secret
- Military-led
- Independent
- Strategic



New Space Paradigm

- International
- Transparent
- Commercial-led
- Interdependent
- All levels of war

Space is becoming "normalized"

Space is moving towards this

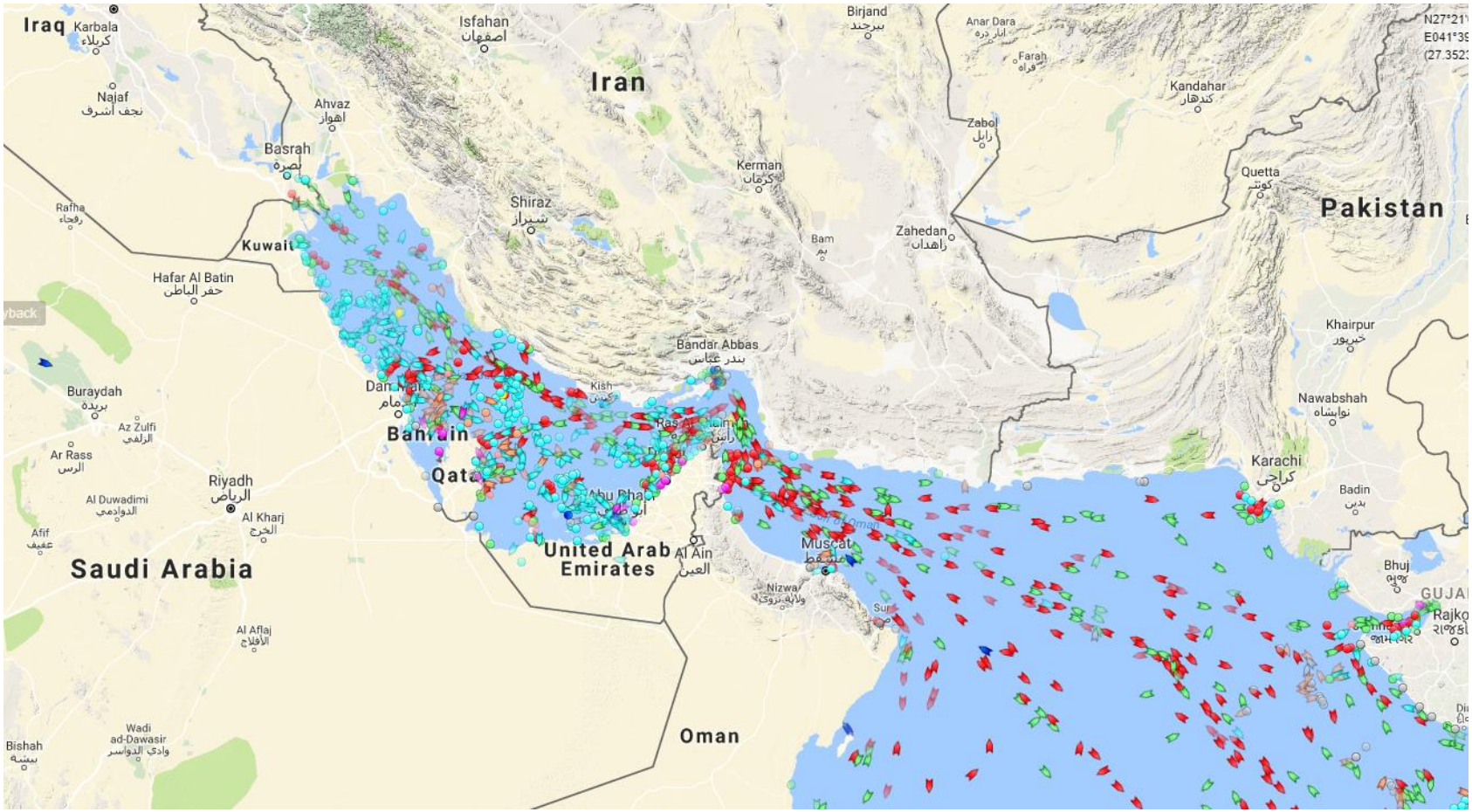


Image credit: MaritimeTraffic.com

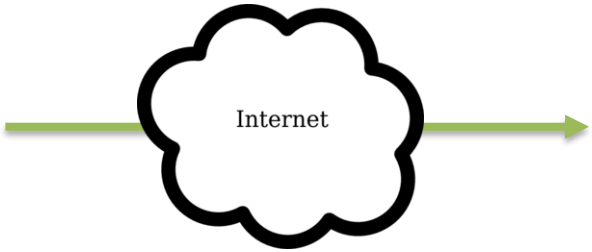
Counterspace capabilities

- Capabilities used to gain ***space superiority*** (ability to use space while denying it to an adversary)
  - **Offensive Counterspace:** deny/degrade/disrupt/destroy adversary space capabilities
  - **Defensive Counterspace**: protect friendly space capabilities
  - **Space situational awareness:** detect and characterize threats (natural and hostile)
- Categories of offensive counterspace
  - **Direct Ascent (DA-ASAT)**: 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
  - **Directed energy (DEW)**: weapons that use focused energy, such as laser, particle, or microwave beams to interfere or destroy space systems
  - **Electronic Warfare (EW)**: 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

Elements of a space capability

Space segment

Ground segment



User segment

Threat Summary - Russia

- Recapitalizing some of the counterspace capabilities they had during the Cold War but had been mothballed/gone fallow
- Multiple tests of ground-based DA-ASAT / mid-course missile defense interceptors
- Limited testing of ground- and air-based DEW laser dazzlers
- Multiple demonstrations of on-orbit rendezvous and proximity operations (RPO) but unclear if weapons-related
  - Could be general tech development and/or intelligence collection
- Operational use of EW capabilities to support integrated military operations in Syria and Ukraine

Threat Summary - China

- Sustained effort to develop a wide range of counterspace technologies
- Multiple tests of ground-based DA-ASATs / mid-course missile defense interceptors
  - Could be developing as many as 3 different types but primary focus is LEO
- Multiple demonstrations of on-orbit RPO but unclear if weapons-related
  - Could be general tech development and/or intelligence collection
- Likely strong EW and DEW capabilities, but no public evidence of use in current military ops
- Strong focus on doctrinal/organizational integration of counterspace

Threat summary – Iran and North Korea

- Nascent space programs with very limited technical capabilities
- Likely to have some components for a DA-ASAT but not all and no indication of any dedicated R&D or testing
- Very limited capabilities for sophisticated satellites or RPO, no indication of any dedicated R&D or testing
- Demonstrated operational use of EW against commercial SATCOM and public GPS

Rendezvous and proximity ops (RPO)

- Chinese RPO demonstrations
  - 2010: SJ-12 with SJ-06F, possible bump
  - 2013: SJ-15 with SJ-7
  - 2015: SJ-15 with CX-3
- Russian RPO demonstrations
  - Nov 2014: Cosmos 2499 with Briz-KM upper stage
  - Jan 2015: Cosmos 2499 with Briz-KM upper stage
  - April 2015: Cosmos 2504 with Briz-KM upper stage, possible bump
  - Aug 2017: Cosmos 2521 with Cosmos 2486
- Russian "Luch" satellite parked near American commercial communications satellites in geostationary orbit
- Chinese SJ-17 demonstrated RPO with Chinese satellites in geostationary orbit

U.S. POLICY RESPONSES

Heightened U.S. concerns

- For much of the last 50 years, the U.S. national security space community didn't worry (much) about hostile threats
  - Main use of space was for strategic purposes (intelligence, nuclear warfare, and treaty verification)
  - Soviet Union had operational ASAT programs from 1960s-1990s, mainly targeting LEO satellites

- U.S. military now reliant on space for projecting military power
  - Wars in Afghanistan and Iraq were first real "space" wars
  - Space capabilities have shifted from strategic to operational/tactical

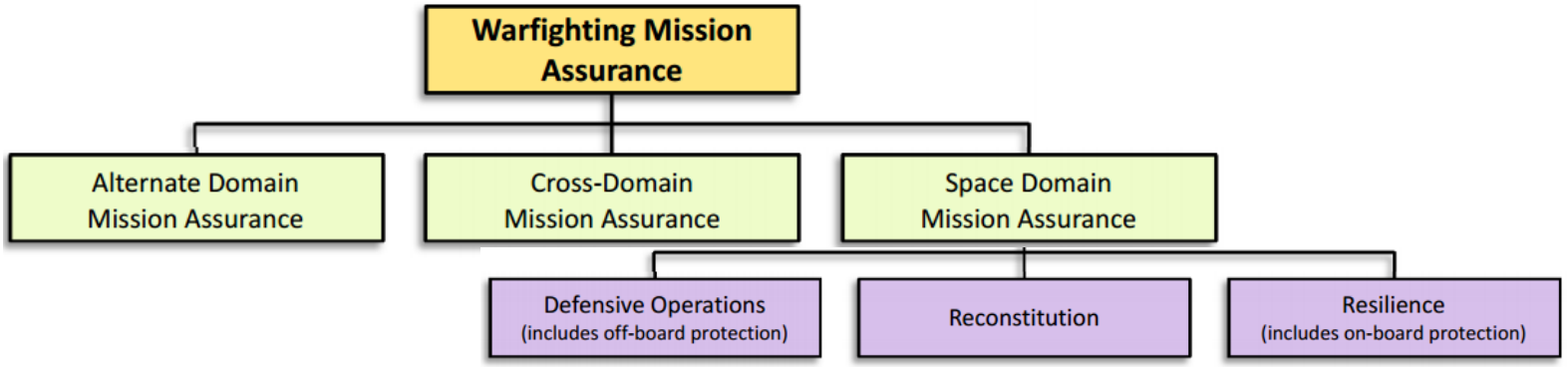
- Growing concerns that future conflicts will involve attacks on space capabilities

International engagement

- Stronger cooperation with allies and partners
  - Rebranded Joint Space Operations Center (JSpOC) as Combined Operations Center (CSpOC)
    - Now formally includes allies and commercial representatives
  - Began including allies in space wargames
    - Started with Five Eyes (UK, Canada, Australia, New Zealand)
    - Expanded to include France, Germany, and Japan

- International discussions
  - Guidelines for long-term sustainability of space
  - Norms of behavior for space activities (governments and private sector)
  - Transparency and confidence building measures (TCBMS) to reduce risk of mistakes and misperceptions

Focus on space mission assurance



Defensive Operations: *Activities or operations undertak kill chain, or provide warning or insight to the targeted r defensive actions.*[5]

Reconstitution: *Plans or operations to bring new ass replacement satellites or activating new ground stations) in order to replenish lost or diminished functions to an acceptable level for a particular mission, operation, or contingency after an attack or catastrophic event.*[5]

Resilience: *The ability of an architecture to support the functions necessary for mission success with higher probability, shorter periods of reduced capability, and across a wider range of scenarios, conditions, and threats, in spite of hostile action or adverse conditions [...].*[6]

Source: Office of the Secretary of Defense

Shift towards a "warfighting" culture

- Stronger integration between military and IC on space
  - Joint Space Doctrine and Tactics Forum (JSDTF)
  - Improve collaboration and coordination on space operations
  - Develop tactics, techniques, and procedures for responding to attacks on space capabilities
- Renewed focus on operating in a contested environment
  - Creation of the Joint Interagency and Combined Space Operations Center (JICSpOC) at Schriever AFB, CO
  - "Experiment" with scenarios

"I hope to never fight a war in space. It's bad for the world. Kinetic [anti-satellite weaponry] is horrible for the world. But if war does extend into space, we have to have offensive and defensive capabilities to respond with, and Congress has asked us to explore what those capabilities would be.

- General John Hyten

Reorganization of military space forces

- Long-running debate over most effective way to organize military space forces
  - U.S. Air Force currently responsible for "operate, train, equip" functions
  - U.S. Strategic Command currently responsible for space warfighting functions

- In 2016, Congress renewed efforts to create a Space Corps within the Department of the Air Force

- In 2018, President Trump directed the creation of a separate Department of the Space Force
  - Will be decided (or not) in the FY20 budget debate

Thank you.
Questions?

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