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SDA, STM, Space Sustainability and Security

Duncan Blake
Indo-Pacific Geointelligence Forum, 7 June 2023

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Outline

- Space sustainability
- Space security
- Space Domain Awareness (SDA)
- Space Traffic Management (STM)
- Where to next?

Space security

- No universal, formal definition
  - build up from foundations
- ‘Security’
  - freedom from danger, threat, fear, want
  - the certain / confident / assured basis to pursue your interests
- ‘Security’ is always referent
  - thing, person/subject, context
  - tend to prioritise security from the inside, out in reference to a sphere of concern
  - ourselves → family → social groups → nation → humanity
- ‘Space’ as the context
  - things – satellites, deep space, launch segment, ground segment, link segment
  - persons – astronauts (and other participants?), everyone (dependence and convenience)
  - dangers – inhospitable nature of space, space weather, space debris, inadvertent interference (physical, electronic and cyber), deliberate hostile activities
  - wants – space-derived services (eg, geointelligence), resources, territory(?) / sovereignty (?), scientific discovery, opportunity, inspiration and wonder

Some examples of approaches to ‘space security’

- Government of Australia, ‘Defence Strategic Review’, May 2023
  - stable, rules-based global order for space
  - assured access to space
  - develop means to protect access to space, and deny an adversary its access to space
- Pranav R. Satyanath, ‘India’s space security policy’, The Space Review, February 2023
  - balance civil space goals with deterrence and warfighting in the space domain
- Government of United States, ’National Space Policy’, December 2020
  - “The United States seeks a secure, stable, and accessible space domain, which has become a warfighting domain as a result of competitors seeking to challenge United States and allied interests in space."
- Space Security Index, website, 2020
  - “The secure and sustainable access to, and use of, space and freedom from space-based threats.”

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Space sustainability

- No universal, formal definition
- UN COPUOS, “Guidelines for the long-term sustainability of outer space activities”, June 2018:
  - “The long-term sustainability of outer space activities is defined as the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.”
- Secure World Foundation, website, April 2019:
  - “the ability of all humanity to continue to use outer space for peaceful purposes and socioeconomic benefit over the long term”
- UN Secretary General, “Our Common Agenda Policy Brief 7: For All Humanity – the Future of Outer Space Governance”, May 2023
  - extends to application of space to UN’s 17 Sustainable Development Guidelines

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Challenges to ‘space sustainability’

- Commercialisation and democratisation
- Space traffic
- Space debris
- Efficient use of frequency
- Resource competition
- Conflict

Linking space security and sustainability?

Links

- Same things, persons, dangers
- Same wants?
- Similar challenges
- Possibly similar means of addressing the challenges

Incongruities

- "… peace on Earth, as it is in heaven …" ?
  - terrestrial and space domains cannot be de-linked
  - use of space for 'peaceful purposes'
- Counterspace capabilities
- Self-referential approach to access and resources (depends on referent entity)

Space Domain Awareness

- No universal definition
- Common elements
  - Identification:
    - Of space objects, space debris, space environmental phenomena.
  - Monitoring:
    - To plot the orbital trajectories of identified objects, enabling real-time situational awareness in space.
  - Collation:
    - Of collected information into a central national or multinational space-object tracking database.
  - Analysis:
    - Of collected information, to anticipate potential ‘conjunction’ events, warn relevant parties, and enable timely avoidance action.
  - Sharing:
    - Of collected information, for mutual benefit, to augment independent space-object tracking databases.
- SDA vs SSA

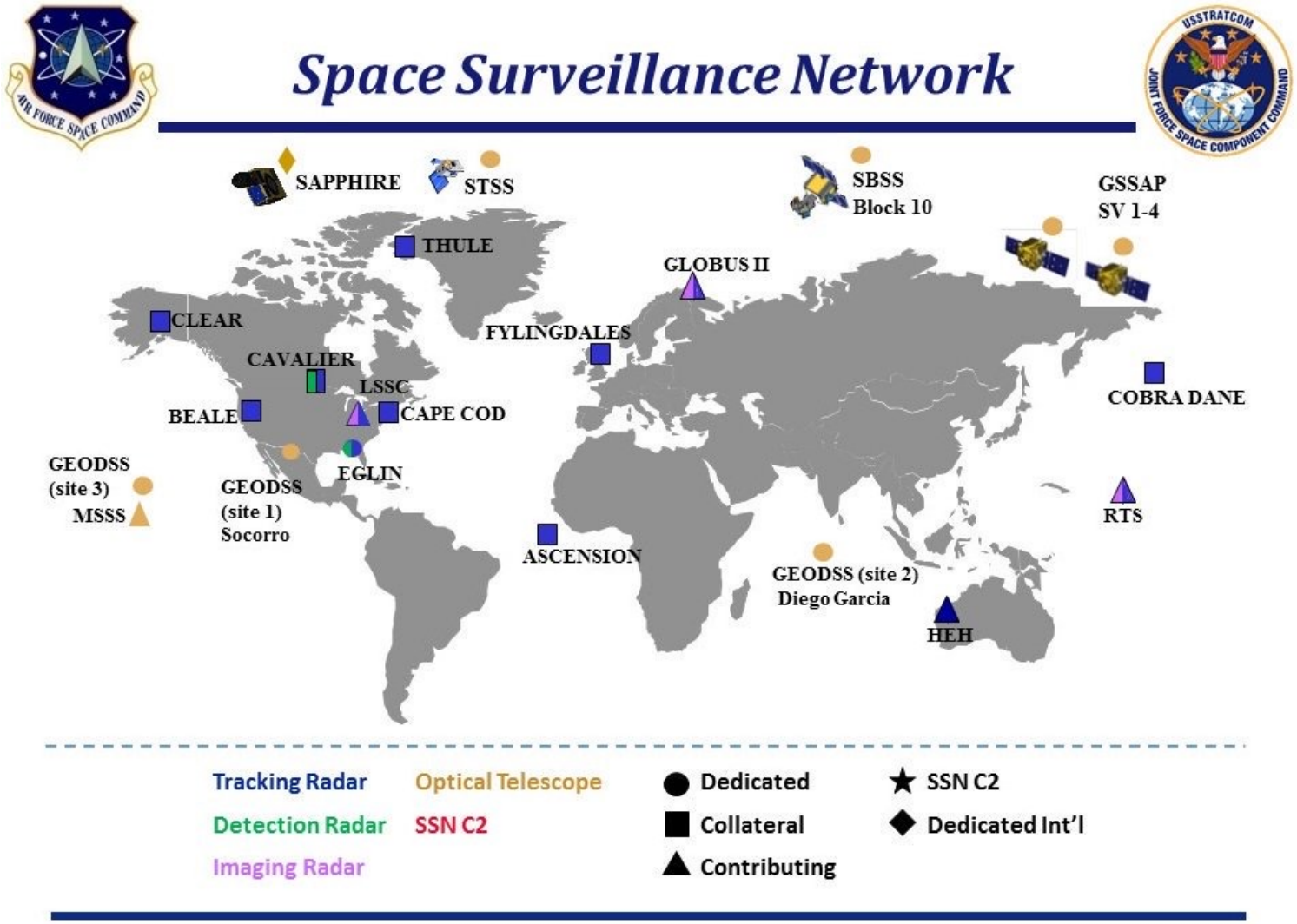
Utility of SDA

- active debris mitigation
- collision warning and avoidance
- space threat identification and warning
- Space Traffic Management
- targeting?

The IDEAL strategic narrative in response to irresponsible use of space

- We know you did it (attribution)
- We can demonstrate to the satisfaction of the international community that you did it (verifiability)
- There is a normative framework covering irresponsible behaviour in outer space (normative framework)
- The normative framework is widely accepted throughout the world (legitimacy)
- It clearly applies to you in these circumstances and you clearly breached the normative framework (clarity)
- We have the capability to impose consequences (capability)
- The consequences will have a substantial effect on you (effectiveness)
- Imposing those consequences will not have an unacceptable adverse effect on us (minimum recoil)

United States



Russia


9
Районы дислокации комплексов 14Ш33 на территории Российской Федерации
- ОЭК 14Ш33
- ЛОЛ
- ОЭК «Окно»
Евпатория
Сторожевая
Змеиногорск
Нурек
Монды
Приморье

China

Chinese Space Launch, SSA, Satellite Control Centers, Command and Control, and Data Reception Stations[219,220]

China has four fixed launch sites. The newest, Wenchang on Hainan Island, has a launch latitude closer to the Equator, which provides a more efficient path to launch satellites into GEO. In 2020, China launched a LM-11 from a barge based in Haiyang Port. China's main satellite control center is in Xian, and its primary control center for human space flight and lunar missions is in Beijing. The PLA operates four large phased array radars (LPAR) most likely used for missile warning and SSA. Additionally, there are at least six ground stations used for satellite C2—including one in Neuquén, Argentina, and five for receiving remote sensing data from satellites—including one located in Kiruna, Sweden.

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Commercial

- LeoLabs
- ExoAnalytic Solutions
- Numerica
- L3 Harris
- Kratos
- EOS
- Lockheed Martin
- … many start-ups
- US Space Force – Sprint Advanced Concept Training


ULYSSE

Space Traffic Management

Legal issues:

- Control vs freedom of use and exploration
- Safety zones vs non-appropriation
- Non-registration and non/under-regulation
- Liability
- Jurisdiction and enforcement

Economic issues:

- Who will pay?
- Monetising STM
- ‘Right of way’ vs burning fuel
- Liability

National security issues:

- Knowledge of space object existence and position
- Freedom of action
- Parsing / normalising outer space
- Dual-use

Technology issues:

- Space Domain Awareness
- Data sharing
- Precise orbital prediction
- Manoeuvrability

Questions and Comments?

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