Small Satellites and the International Arena

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Overview

- U.S. statement on small satellites at the United Nations
  - United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) Legal Subcommittee
- Authorization and Continuing Supervision
  - Outer Space Treaty Article VI
- Long-Term Sustainability of Outer Space Activities
  - COPUOS – Working Group Draft Guidelines
- National Space Transportation Policy
  - Foreign launch requirements

Small Sats at the U.N.

- Small satellites are an agenda item at the Legal Subcommittee (LSC) of COPUOS, which met this past April.
- In its statement on this agenda item, the United States expressed:

For nearly six decades, small satellites have often served as a nation's first step into outer space. These spacecraft have served as key milestones in the development of national space programs and have yielded invaluable scientific insights.

. . . small satellites are vastly more capable and offer exciting new opportunities for operational applications as well as scientific research and technology development.

COPUOS LSC

- *The United States encourages the development and utilization of small satellites, as they represent an emerging and useful method of lowering barriers of access to space, and provide opportunities for education, scientific exploration, and commercial activities serving a wide range of applications.*

- *. . . as with any space mission, it is imperative that small satellite missions comply with the relevant laws, regulations, and policies that will protect the sustainability of outer space. Consequently, the small satellite activities of the U.S. government and private sector entities are treated like any other mission with regard to their adherence to orbital debris mitigation guidelines, export control laws, and radio frequency spectrum use.*

COPUOS LSC (cont'd)

- *As technological advances and innovative ideas push the capabilities to even smaller designs with perhaps many more units, the United States is committed to working to resolve any challenges now and in the future.*
- Finally, the United States specifically acknowledged and appreciated work on small satellites in the UN system:
  - the UN Office of Outer Space Affairs and
  - the International Telecommunication Union
  - Informing and educating new satellite operators, including small satellite operators, about international obligations concerning space operations:
    - Handout
    - Outreach to and ongoing contact with U.S. small satellite operators.
  - Helpful in ensuring that newer operators successfully join and participate in the larger community of space operators.

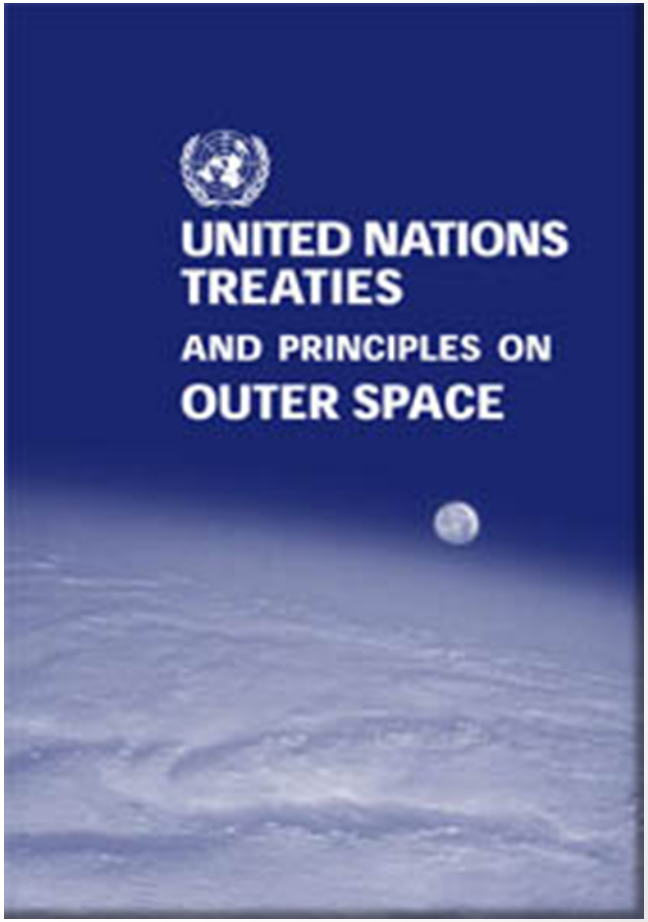
Authorization and Continuing Supervision

- U.S. statement to the LSC of UNCOPUOS:

  . . . the relative accessibility of small satellite platforms has introduced a diverse and growing range of non-governmental entities to the ranks of spacecraft operators. As these small satellites move from the drawing board and into orbit, States will need to ensure they have national mechanisms in place for authorizing and supervising non-governmental small satellite activities as well as ensuring governmental activities are consistent with the international governance framework for outer space.

The Core Outer Space Treaties

- 1967 Outer Space Treaty
- 1968 Rescue Treaty
- 1972 Liability Convention
- 1976 Registration Convention



Authorization and Continuing Supervision (cont'd)

- Article VI of the Outer Space Treaty:

"States . . . bear international responsibility for national activities in outer space . . . *whether such activities are carried on by governmental or by non-governmental entities*, and for assuring that national activities are carried out in conformity with the provisions [of the Treaty]. The activities of non-governmental entities in outer space . . . shall require *authorization and continuing supervision by the appropriate State party to the Treaty.*"

U.S. Implementation of Article VI

- The United States implements Article VI obligation through licensing programs administered by three agencies:

    1. FAA licenses launch and reentry;
    2. FCC licenses broadcast from space;
    3. NOAA licenses remote sensing of the Earth.

- This national regulatory framework is adequate for existing commercial space activities – launch services, communications and remote sensing satellites.

Newly Contemplated Commercial Space Activities

- On-orbit servicing of satellites
- Maneuvering and docking of small satellites/ propulsion
- Manufacturing in Space – additive manufacturing (3D) printing
- Asteroid and lunar mining
- Lunar habitats/commercial habitable space stations
- Solar power stations in space

U.S. Commercial Space Launch Competitiveness Act (November 15, 2015)

Enacted Legislation

- U.S. Commercial Space Launch Competitiveness Act (November 15, 2015)
- Requires reporting in three areas:
  - (1) Assess current and proposed near-term, commercial non-governmental activities conducted in space;
  - (2) Identify appropriate authorization and supervision authorities for the activities described in (1); and
  - (3) Recommend an authorization and supervision approach that would prioritize safety, utilize existing authorities, minimize burdens to the industry, promote the U.S. commercial space sector, and meet the United States obligations under international treaties.

(1) Assess commercial non-governmental space activities

- Three categories of unprecedented commercial space activities planned by American companies:

1. Private missions beyond Earth orbit;
2. New on-orbit activities:
   - End-of-life extension modules, which attach to a satellite to aid in station-keeping or transfer to a graveyard orbit;
   - Satellite repair utilizing robotic arms;
   - Satellite refueling utilizing fuels launched from Earth;
   - Satellite refueling utilizing fuels derived from space resources; and
   - Commercial orbital habitats; and
3. Space Resource Utilization

(2) Identify authorization and supervision authorities

- Existing licensing frameworks do not, by themselves, provide the United States Government with a straightforward means to fulfill its treaty obligation to ensure the conformity of some of these emerging activities with the provisions of the Outer Space Treaty.
- The Administration is actively pursuing mechanisms, including a legislative proposal, to enable the Government to authorize innovative new space activities by U.S. companies consistent with international obligations.

(3) Recommend an authorization and supervision approach

- Desired: a clear and predictable authorization process that ensures access to space and imposes minimal burdens on the industry.
  - narrowly tailored authorization process for newly contemplated commercial space activities,
  - only such conditions as are necessary for compliance with the United States' international obligations, foreign policy and national security interests, and protection of United States Government uses of outer space.
- The Administration developed a legislative proposal for a "Mission Authorization" framework.

Mission Authorization

- Not a comprehensive regulatory framework mirroring those for mature commercial space activities, such as launch services.
  - intended to establish a process no more burdensome than is necessary to enable the United States Government to authorize these pioneering space activities in conformity with its treaty obligations
- Similar to current FAA Payload Review process.

Mission Authorization

- Provides for a Mission Authorization Registry and Conjunction Analysis by FAA
- Not intended to affect existing space activities such as launch services, communications, or remote sensing for which current regulation by the FAA, FCC, or NOAA is sufficient to fulfill the United States' obligations under the Outer Space Treaty.

Long-Term Sustainability

- 2010: The Scientific and Technical Subcommittee of COPUOS began considering LTS as an agenda item.
- 2011: A Working Group on the Long-term Sustainability of Outer Space Activities was established (Chair from South Africa)
- Objectives include:
  - identifying areas of concern for the long-term sustainability of outer space activities,
  - proposing measures that could enhance sustainability, and
  - producing voluntary guidelines to reduce risks to long-term sustainability.

Draft LTS Guidelines

- Areas addressed by Expert Groups include:
  - sustainable space utilization supporting sustainable development on Earth;
  - space operations and tools to support collaborative space situational awareness;
  - space weather; and
  - regulatory regimes and guidance for actors in the space arena.
- Expert Groups reported to the Working Group Chair in 2014; impasse in 2015 through February 2016; meeting in June 2016 to try to resolve

Draft LTS Guidelines (cont'd)

- 29 draft voluntary guidelines
- Majority of COPUOS members believe that 15 of 29 of the guidelines are ready to achieve consensus within the Work Plan
- Work Plan ends in June 2016 unless the mandate is extended.
- Majority of member states have shown a willingness to extend the mandate if progress is shown.

Draft LTS Guidelines (cont'd)

Of particular relevance to small satellites:

- Guideline 1: Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities
- 1.3 . . . States should consider not only existing space projects and activities but also, to the extent practicable, the potential development of their national space sector, and envisage appropriate timely regulation in order to avoid legal lacunae. It is important for national regulations to address the specific nature and characteristics of the State's space sector, as well as its general economic framework, which provides the context in which the space sector may further expand.

Draft LTS Guidelines (cont'd)

- Guideline 2: Consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities
- 2.2 . . . States . . . should:
  - (b) Implement space debris mitigation measures, such as the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, through applicable mechanisms;
  - (c) Address, to the extent practicable, risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects.

Draft LTS Guidelines (cont'd)

- Guideline 3: Supervise national space activities
- 3.1 In supervising space activities of non-governmental entities, States should ensure that entities under their jurisdiction and/or control that conduct outer space activities have the appropriate structures and procedures for planning and conducting space activities in a manner that supports the objective of enhancing the long-term sustainability of outer space activities, and that they have the means to comply with relevant national and international regulatory frameworks, requirements, policies and processes in this regard. . . .

Draft LTS Guidelines (cont'd)

- 3.2 States bear international responsibility for national activities in outer space and for the authorization and continuing supervision of such activities, which are to be carried out in conformity with applicable international law. In fulfilling this responsibility, States should encourage each entity conducting space activities to:

Draft LTS Guidelines (cont'd)

- (a) Establish . . . technical competencies required to conduct the outer space activities in a safe and responsible manner and to enable the entity to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes;
- (b) Develop specific requirements and procedures to address the safety and reliability of outer space activities under the entity's control, during all phases of a mission life cycle;
- (c) Assess all risks to the long-term sustainability of outer space activities associated with the space activities conducted by the entity, in all phases of the mission life cycle, and take steps to mitigate such risks to the extent feasible.

Draft LTS Guidelines (cont'd)

- Guideline 12: Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects
- 12.1 . . . Promote . . . techniques . . . to improve the accuracy of orbital data for spaceflight safety and the use of common, internationally recognized standards when sharing orbital information on space objects.
- 12.2 . . . methods could include national and international activities to improve the capabilities and geographical distribution of existing and new sensors, use of passive and active on-orbit tracking aids, and combining and validating data from different sources. . . .

Draft LTS Guidelines (cont'd)

- 12.3 When sharing orbital information on space objects, operators and other appropriate entities should be encouraged to use common, internationally recognized standards to enable collaboration and information exchange. Facilitating greater shared awareness of the current and predicted location of space objects would enable timely prediction and prevention of potential collisions.

Draft LTS Guidelines (cont'd)

- Guideline 13: Promote the collection, sharing and dissemination of space debris monitoring information
- 13.1 States [should] . . . encourage . . . relevant technologies for the measurement, monitoring and characterization of the orbital and physical properties of space debris. . . . also promote the sharing and dissemination of derived data products and methodologies in support of research and international scientific cooperation on the evolution of the orbital debris population.

Draft LTS Guidelines (cont'd)

- Guideline 14: Perform conjunction assessment during all orbital phases of controlled flight
- 14.1 States . . . should, through national mechanisms or international cooperation, perform conjunction assessment during all orbital phases of controlled flight. States should encourage entities under their respective jurisdiction and/or control that conduct space activities to perform such conjunction assessment.
- 14.2 Conjunction assessment with other space objects should be performed for all spacecraft capable of adjusting trajectories during orbital phases of controlled flight for current and planned spacecraft trajectories.

Draft LTS Guidelines (cont'd)

- 14.3 Appropriate steps of the conjunction assessment process include improving the orbit determination of relevant space objects, screening current and planned trajectories of relevant space objects for potential collisions, and determining whether an adjustment of trajectory is required to reduce the risk of collision, in coordination with other operators and/or organizations responsible for conjunction assessment, as appropriate.
- 14.4 States . . . should develop and implement common approaches to conjunction assessment, including sharing information on the proper interpretation and usage of the conjunction information.

USG Payloads on Foreign Launch Vehicles

To launch U.S. Government payloads in a foreign launch vehicle:

- The Government is required to follow the procedure set forth in the 2013 National Space Transportation Policy.
- Likewise, non-government entities must follow the same procedure when their payloads are U.S. Government funded.

USG Payloads on Foreign Launch Vehicles (cont'd)

- The Policy provides that:

  United States Government payloads shall be launched on vehicles manufactured in the United States unless an exemption is coordinated by the Assistant to the President and National Security Advisor and the Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy through an interagency process.

USG Payloads on Foreign Launch Vehicles (cont'd)

- A prospective commercial satellite operator would need to work with its sponsoring department or agency to:
  - review the operator's plans,
  - see whether the operator is not required to seek an exemption if a case can be made for that, and
  - if an exemption is needed, request that the sponsoring department or agency work through the process with the National Security Council (NSC) and the Office of Science and Technology Policy(OSTP) in the interagency process.
- The general rule is that an exemption is required for U.S. Government payloads launched on vehicles not manufactured in the United States.

USG Payloads on Foreign Launch Vehicles (cont'd)

- Exception examples: If the payload is a secondary payload that is scientific, and the operator can demonstrate that no other U.S. launch service is available, the operator would need to get the review and approval of the sponsoring department; if approved would not need to get an exemption, and would be then able to proceed.
- If the situation includes a no-exchange-of-funds agreement for an international scientific program or a scientific instrument, with the approval of the sponsoring department the operator also would not need an exemption.
- Consult the Policy; This is in addition to ITAR/Export Controls requirements.