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## 宇宙利用の長期持続性と宇宙空間平和利用委員会の役割

### Long Term Sustainability of Outer Space Activities and Role of UNCOPUOS

堀川 康（宇宙空間平和利用委員会前議長、JAXA 技術参与）

Yasushi Horikawa, Former Chair of UNCOPUOS  
and Technical Counselor of JAXA

In recent years, the utilization of space has seen an increasing number of States, non-governmental organizations, private sector entities and even universities expanding their presence. In an era where we are seeing space becoming increasingly crowded with new players, the need to show strong commitment to sharing responsibilities and acting responsibly in space to help prevent misperceptions, miscalculations and mistrust has never been greater. The proliferation of space debris and the increased possibility of a collision interfering with or causing damage to space objects raises concerns about long term sustainability of space activities, particularly the low-Earth orbit and geostationary orbit environment. With regard to the long term sustainability of outer space, the role of UNCOPUOS and the current and updated status of discussions on the long term sustainability of outer space activities will be presented.

#### **Biography**

##### **Yasushi HORIKAWA** (Japan)

Dr. Horikawa, as a technical counselor of Japan Aerospace Exploration Agency (JAXA), provides advices to international relations and application satellite development and utilization programs of JAXA. He is also the Chair of the United Nations Committee on Peaceful Use of Outer Space (UNCOPUOS) for 2012- 2013. During his carrier, he has assumed various executive and leadership positions. From 2005 to 2009, he served as an executive director of JAXA responsible for the development of application satellites such as Earth observations, communications, broadcasting and global positioning satellites as well as the operation and utilization of these satellites. He contributed to the development of the International Space Station as Japanese Program Manager and to the successful implementation of Japanese meteorological satellite programs and Earth observation programs.

A graduate of the University of Tokyo and received PhD from the University of Tokyo on Electronics Engineering.



**Space Debris Symposium  
@ JAXA Chofu**




**Long Term Sustainability of Outer Space activities  
and  
Role of COPUOS**

**Dec. 17, 2014**




**Yasushi Horikawa  
Former Chair of UNCOPUOS  
Technical Councilor of JAXA**



## UN COPUOS – Overview

- UN COPUOS (Committee on the Peaceful Uses of Outer Space) is the primary international forum for the development of laws and principles governing activities in outer space
- A standing committee of the UN, founded in 1959 by 24 Member States
  - Currently 77 Member States and a large number of permanent observers
  - The technical work of COPUOS is carried out by two subcommittees.
    - \* Scientific and Technical Subcommittee (STSC)
    - \* Legal Subcommittee (LSC)
  - Decisions are reached by absolute consensus
  - Secretariat is the UN Office for Outer Space Affairs (Vienna)



## UN COPUOS – Member States



## UN COPUOS – Key Achievements

- **5 treaties on outer space:** peaceful use, registration, liability, astronaut return and moon
- **10 sets of Legal principles, guidelines or frameworks** governing activities of States, including remote sensing, space debris mitigation, nuclear power source, etc
- **Over 110 General Assembly resolutions and recommendations** on outer space matters
- **3 UN space conferences (1968, 1982, 1999)**
- **UN program on space applications**
  - Many workshops each year
  - Regional Centres for Space Science and Technology Education
  - SPIDER (Disaster Management)
  - International Committee on GNSS
- **Activities relating to space security/sustainability**
  - UN COPUOS space debris mitigation guidelines
  - UN COPUOS/IAEA safety framework for nuclear power source applications in outer space
  - WG on long-term sustainability of outer space activities of the STSC
  - In recent years, **tendency to non-binding decisions, rather than treaties.** (Non-binding does not mean non-legal)



## Space Treaty, Principle and Guideline

Outer Space Treaty	
1967	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (102states)
1968	Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (92states)
1972	Convention on International Liability for Damage Caused by Space Objects (89states)
1976	Convention on Registration of Objects Launched into Outer Space (60states)
1984	Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (15states)
Principle and Guideline	
1963	Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space
1982	Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting
1986	Principles Relating to Remote Sensing of the Earth from Outer Space
1992	Principles Relevant to the Use of Nuclear Power Sources in Outer Space
1996	Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries
2004	Application of the concept of the "launching State"
2007	Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects
2007	Space debris mitigation guidelines of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space
2012	Recommendations on national legislation relevant to the peaceful exploration and use of outer space
Framework	
2009	Safety Framework for Nuclear Power Source Application in Outer Space

## UNCOPUOS – Agenda (2014)

### COPUOS Main Committee

- General Exchange of Views
- Ways and means of maintaining outer space for peaceful purposes
- Report of STSC
- Report of LSC
- Space and sustainable development
- Spin-off benefits of space technology
- Space and water
- Space and climate change
- Review of current status: Use of space technology in the UN system
- Future role of the Committee

### STSC

- UN Programme on Space Application
- Remote sensing
- Space debris
- Space-system-based disaster management support
- Recent developments in global navigation satellite systems
- Space weather
- Near-Earth objects
- Use of NPS in outer space
- Long term sustainability
- Use of GEO

### LSC

- Application status of UN space treaties
- Information on the activities of IGO and NGO relating to space law
- Definition and delimitation of outer space and the character and utilization of the geostationary orbit
- National legislation on peaceful uses of space
- Review of principles on use of NPS in space
- International Interests in Mobile Equipment on Matters Specific to Space Assets
- Capacity building in space law
- National mechanisms relating to space debris
- International mechanisms on international cooperation



## Highlights and main results of COPUOS and its two Subcommittees

### Recent achievements:

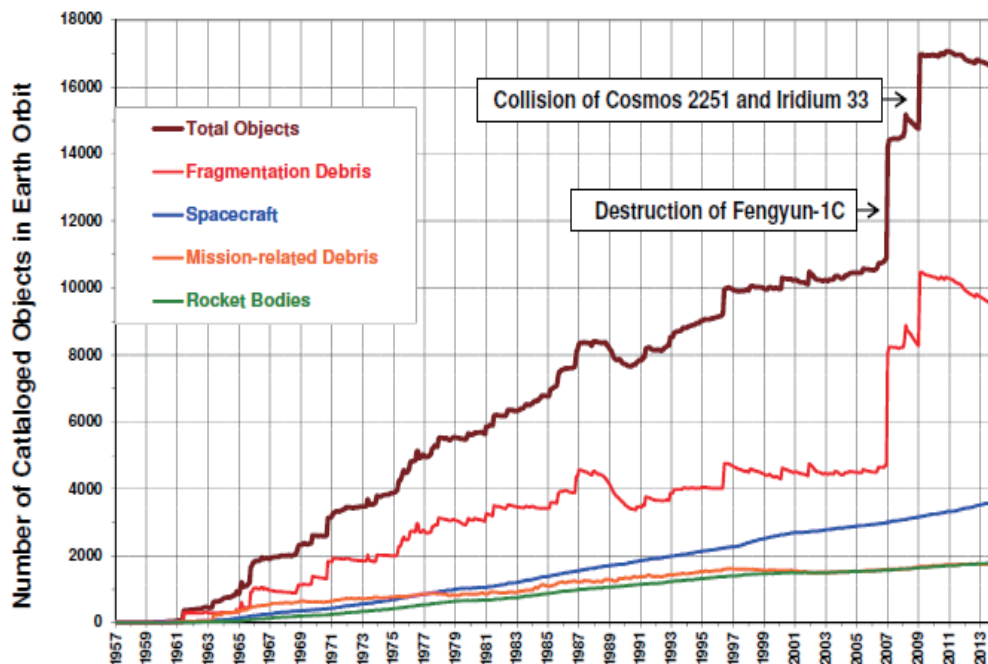
- Establishment of the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) (2006)
- Establishment of the International Committee on Global Navigation Satellite Systems (ICG) (2006)
- Space Debris Mitigation Guidelines (2007)
- GA Resolution on enhancing the practice of States and international intergovernmental organizations in registering space objects (2007)
- Safety Framework for the Use of Nuclear Power Sources in Outer Space (2009)

### Current issues - Space Agenda Today:

- Space applications for developing nations
- Space debris
- Long-term sustainability of space activities
- Near-Earth objects
- Space and climate change
- National space legislation
- Definition and delimitation of outer space
- Use of Geospatial Data for Sustainable Development
- International mechanisms on international cooperation

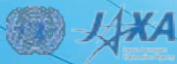


## Trend of Space Debris



## Needs of Space Sustainability

- All humanity can use space for peaceful purposes and for socioeconomic benefits.
- Space technology is a critical tool to support sustainable development.
- The Earth's orbital space environment and Radio-Frequency Spectrums are limited natural resources.
- Access for Education and Capacity Building Purposes are Increasing.



## Threats in Orbit

### Threats for Outer Space Activities

- Orbital Debris
- Radio Frequency Interference
- Near Earth Objects

### Factor of Threats

- Emerging Space Actors (New Emerging Countries and Non-Governmental Entities such as Private Sectors or Universities)
- Spontaneous Increase of Space Debris
- Difficulties of Active Removal
- Lack of Transparency and Confidence Building Measures
- Difference of Priorities and Funding Levels on Outer Space activities
- A-SAT Testing for Security Reasons
- Space Based Military Systems



## Urgent Needs of Coordination for Outer Space Activities

- Limited nature of some space resources will require governance challenges to ensure equitable access for entities.
- International cooperation will support in the transfer of expertise and technology for the access to, and use of space, by emerging space actors.
- Space industry will lead to decreasing costs for space access and use, and may increase the accessibility for a wider range of space actors.
- Military space sector may be an important driver in the advancement of capabilities to access and use space, but may be source of friction.



## Coordination Mechanisms

### Coordination Mechanisms for International Cooperation

- Long Term Sustainability Working Group (LTSWG) established in the Scientific and Technical Subcommittee of UNCOPUOS----Voluntary based Best Practice Guideline
- International Code of Conduct (ICoC) for Outer Space Activities initiated by European Union----Voluntary based Politically Binding
- Report from UN Group of Governmental Experts (GGE)----Selected by UN Secretary General
- Treaty on Prevention of the Placement of Weapons in Outer Space and the Threat of the Use of Force against Outer Space Objects (PPWT) ----Leagally Binding
- Conference of Disarmament (CD) is still deadlocked

### Various Approach

- Consensus vs Voting
- National vs Multilateral
- Voluntary Base vs Politically or Leagally Binding



## WG on Long-Term Sustainability of Space Activities

### Objective

- The objective of the Working Group is **to examine and propose measures to ensure the safe and sustainable use of outer space** for peaceful purposes, for the benefit of all countries

### Terms of Reference

- The Working Group will **examine the long-term sustainability** of outer space activities in the wider context of sustainable development on Earth
- The work will take into consideration **current practices, operating procedures, technical standards** and
- The Working Group will take **as its legal framework the existing United Nations treaties and principles**

### Outcomes by 2014 (changed to by 2016)

- **Prepare a report** on the long-term sustainability of outer space activities
- Produce a set of **voluntary recommended guidelines**

### Organization of works

- **Four Expert Groups** (sustainable space utilization, space debris, space weather, regulatory regime)
- **Inputs received from international organisations (e.g. IAA, IADC, CCSDS, etc.) and non-governmental organisations**



## Clustering

**A. Expert group on sustainable space utilization supporting sustainable development on Earth**  
**Co-Chairs: Filipe Duarte Santos (Portugal) and Mr. Enrique Pacheco Cabrera (Mexico)**

**B. Expert group on space debris, space operations and tools to support collaborative space situational awareness**  
**Co-chairs: Claudio Portelli (Italy) and Dick Buenneke (USA)**

**C. Expert group on space weather**  
**Co-Chair: Takahiro Obara (Japan) and Mr. Ian Mann (Canada)**

**D. Expert group on regulatory regimes and guidance for actors in the space arena**  
**Co-Chair: Sergio Marchisio (Italy) and Michael Nelson (Australia)**



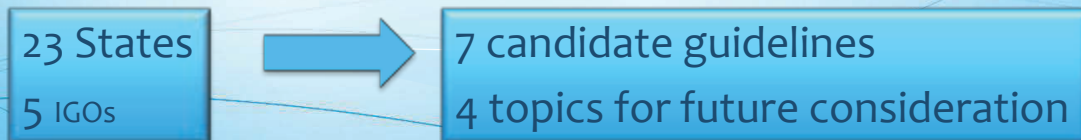


(Next 4charts are excerpts from WG chair's presentation materials.)  
**Topics for Discussion: 1/4**

**Expert Group A: Sustainable space utilization supporting sustainable development on Earth**

co-CHAIRS: FILIPE DUARTE SANTOS (PORTUGAL), ENRIQUE PACHECO CABRERA (MEXICO)

- \* The contribution of space science and technology to sustainable development on Earth
- \* The concept of sustainable development extended to the domain of outer space
- \* Equitable access to the limited resources of outer space benefits of space activities
- \* International cooperation in peaceful uses of outer space as a means of enhancing space sustainability and supporting sustainable development on Earth



**Topics for Discussion: 2/4**

**Expert Group B: Space Debris, Space Operations and Tools to Support Collaborative Space Situational Awareness**

co-CHAIRS: RICHARD BUENNEKE (USA), CLAUDIO PORTELLI (ITALY)

**Space debris:**

- \* Collection, sharing and dissemination of data on space objects
- \* Techniques to improve accuracy of orbital data on space objects
- \* Implement space debris mitigation measures

**Space operations:**

- \* Conjunction assessment during orbital phases of flight
- \* Limit for the risk to people and property from controlled re-entry

**Tools to support collaborative space situational awareness:**

- \* Provision of appropriate contact information
- \* Common standards for sharing information
- \* Provision of Registration information in the identification of space objects



## Topics for Discussion: 3/4

### Expert Group C: Space Weather

co-CHAIRS: TAKAHIRO OBARA (JAPAN), IAN MANN (CANADA)

- \* Collection, sharing and dissemination of data and forecasts
- \* Capabilities to provide a comprehensive and sustainable network of sources of key data in order to observe and measure phenomena related to space weather in real or near-real time
- \* Open sharing of established practices and guidelines to mitigate the impact of space weather phenomena on operational space systems
- \* Coordination among States on ground-based and space-based space weather observations in order to safeguard space activities

27 States  
5 IGOs



5 candidate guidelines  
2 topics for future consideration



## Topics for Discussion: 4/4

### Expert Group D: Regulatory Regimes and Guidance for Actors in the Space Arena

CO-CHAIRS: SERGIO MARCHISIO (ITALY), MICHAEL NELSON (AUSTRALIA)

#### Regulatory regimes:

- \* Adherence to existing treaties and principles on the peaceful uses of outer space
- \* Review of the regulatory framework and the tools for the use and transfer of space technologies within international cooperation and international turnover of controlled space-related goods
- \* National regulatory frameworks for space activities

#### Guidance for actors in the space arena:

- \* International cooperation as a means to promote LTS
- \* Sharing of experiences relating to LTS, such as technical standards, best practices and lessons learned
- \* Technical and legal capacity-building for emerging space actors countries

25 States  
6 IGOs



11 candidate guidelines  
5 topics for future consideration



## Emerging Candidate Guidelines

- The Expert Groups have produced 31 candidate guidelines for consideration by the WG and 2 additional guidelines were proposed by WG chairman.
- The candidate guidelines of the EGs are necessarily thematically oriented and some address cross-cutting issues from a thematic perspective.
- These guidelines can be broadly grouped into implementation-oriented categories, such as:
  - ✓ Policy, regulatory, and organizational,
  - ✓ Scientific and Technical,
  - ✓ International Cooperation and Capacity building
- In June 2014, the Working Group began its consideration of the candidate guidelines, 3 additional guidelines, 2 from Russia and 1 from Switzerland were added and agreed on a framework for the consolidation of the candidate guidelines to eliminate duplication (currently 19 guidelines in total) and to harmonise terminology.
- The WG will also address definitional and translation issues to ensure clarity of the guidelines.
- New guidelines and/or amendments are also being proposed by the Member States.
- Provision is made for implementation mechanisms and for updating of guidelines in future.

Time is not on our side. The WG will need to find a balance between issues where consideration is mature enough to reach consensus on guidelines and issues requiring further consideration in COPUOS.



## Consolidated Guidelines (1)

**33 guidelines are consolidated to 19 guidelines. Following 19 titles of guidelines are under consideration. (These are not guidelines themselves but just titles due to limitation of space)**

### **Policy, regulatory and organizational**

- Supervising national space activities
- Registration information on space objects
- Contact information and information on space objects and orbital events
- Spectrum protection
- Adoption of national regulatory frameworks
- Elements to be taken into consideration when developing national regulatory frameworks
- States and international intergovernmental organizations should develop and implement criteria and procedures for the preparation and conduct of space activities aimed at the active removal of space objects from orbit (Russian Proposal)



## Consolidated Guidelines (2)

- **Respect the security of foreign space-related ground and information infrastructures (Russian Proposal)**
- **Awareness of space activities**

### Scientific and technical

- **Research on and development of ways to support sustainable exploration and use of outer space**
- **Data on space objects**
- **Perform conjunction assessment during orbital phases of controlled flight**
- **Promotion of research on orbital debris and sharing of space debris monitoring information**
- **Development of space weather models and tools and collection of established practices on the mitigation of space weather effects**
- **Sharing operational space weather data and forecasts**
- **Investigation and consideration of new measures to promote the sustainability of outer space activities in the medium and long term (Swiss Proposal)**



## Consolidated Guidelines (3)

### International cooperation and capacity-building

- **International cooperation in support of the long-term sustainability of outer space activities**
- **Sharing of experience related to the long-term sustainability of outer space activities and procedures for information exchange**
- **Capacity-building**



## Timeline

- 2011** WG adopts Terms of Reference and three-year work plan  
WG establishes four expert groups to consider topics in TOR
- 2012** First COPUOS Long-Term Sustainability Workshop  
Practices of States to promote LTS  
Expert Groups commence work and refines list of topics to discuss
- 2013** Second COPUOS Long-Term Sustainability Workshop  
Practices and experiences of non-State actors  
Candidate guidelines proposed by expert groups
- 2014** WG begins consideration of draft guidelines during STSC  
Presentation by Chair of WG to COPUOS Legal Subcommittee of COPUOS  
Begin consideration of consolidated guidelines and review work plan
- 2015** Submit proposals on new elements, structural change or additional guidelines  
WG consolidates the updated draft guidelines
- 2016** Agree on the form of guidelines to be presented to General assembly  
Consider topics for future discussion



## CONCLUSIONS

- Space utilization activities under the framework of United Nations should be conducted focusing on resolving the issues of humankind through international cooperation.
- Specifically, in the field of application satellite program, the significance of technological advancement and continuous utilization of satellites for the improvement of the daily lives for humankind is essential.
- Coordination for international cooperation and capacity building for developing countries is vital.
- It would be important to look into the overall role in meeting the needs for long-term space utilization **by appropriately identifying the synergies of common interest issues with related countries.**



# Thank you for your attention!

Visit UNOOSA Website :

<http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html>



## Initiatives Proposed by COPUOS Chair

The three main ideas targeting space research and utilization in response to the 50<sup>th</sup> Anniversary Declaration

1. To promote the role of the Committee and its Subcommittees as a unique platform at the global level for international cooperation in space research and long-term space utilization;
2. To promote dialogue between the Committee and regional and inter-regional cooperation mechanisms in space activities for the benefit of global development; and
3. To strengthen the relevance of space science and technology and their applications in meeting the outcomes of the United Nations Conference on Sustainable Development (Rio+20)

## UN GGE on TCBMs

- **UN Group of Govt Experts on Transparency and Confidence Building Measures (TCBMs) for Outer Space Activities**
- **UN General Assembly Resolution A/Res/65/68 of 2010**
- **15 Experts selected for geographical balance & knowledge**
- **The GGE is to conduct a study on outer space transparency and confidence-building measure**
  - **making use of relevant reports of the UN Secretary-General**
  - **without prejudice to the substantive discussions on the prevention of an arms race in outer space within the framework of the CD**
  - **and to submit to the General Assembly at its sixty-eighth session (in 2013) a report with an annex containing the study of governmental experts**
- **TCBMs are meant to be voluntary and not legally binding**

## Code of Conduct

- \* **Proposed by EU**
- \* **Principles**
  - \* **freedom for all to use outer space for peaceful purposes**
  - \* **preservation of the security and integrity of space objects in orbit**
  - \* **due consideration for the legitimate security and defence interests of States**
- \* **All-encompassing in scope**
- \* **Focuses on establishing norms of behaviour and proscribing irresponsible behaviours**
- \* **Not legally-binding, a political commitment**

EU lacks a multilateral mandate. Process needs to be “multilateralised”

## Conference on Disarmament (CD)

- Some States believe that conflict in outer space would have such terrible consequences that they would like to ban the use of weapons in space through a legally binding treaty
  - However, there are definitional problems
- CD has discussed Prevention of an Arms Race in Outer Space (PAROS) for a number of years
- However, CD is deadlocked because States cannot agree on its agenda, so there has been no progress on PAROS
- In 2008 China and Russia introduced draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT)
- PPWT has support of many States, but not all, because of definitional issues and verification concerns of the PPWT

## International Space Law

- International space law contains several obligations for States carrying out space activities (**registration, responsibility, liability...**)
- **Privatization, commercialization of space activities** as well as international cooperation have increased in recent years
- Private/commercial/non-governmental entities are **not bound by international (space) law**
- **Implementation of international space law is needed** to ensure that international space law is complied with at all levels.

## Obligations of States under International Space Law

- (1) **Registration of space objects**
- (2) **Liability of the launching States(s)**
- (3) **Duty of authorization and supervision**
- (4) **Others :**
  - no placement of weapons of mass destruction in Earth orbit,
  - facilitate and encourage international cooperation,
  - paying due regard to the interests of other countries....



## Concluding Remarks

- To succeed world-class mission:  
Firm advanced mission requirements, high reliability and assured quality, operational life, and low life cycle cost
- Advancement of technical capability:  
Well structured development process, standardization, incorporation of lessons learned, and thorough review
- Advanced launch notification and information exchange of the space objects for sustainable use of outer space
- Coordination for international cooperation and capacity building for the long term sustainability of outer space



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**<http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html>**

*Thank you for your attention*