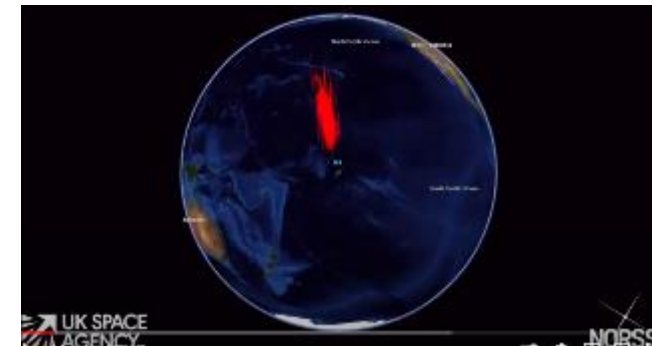


# Emerging Activities and Risks in Outer Space – Need for Sustainability

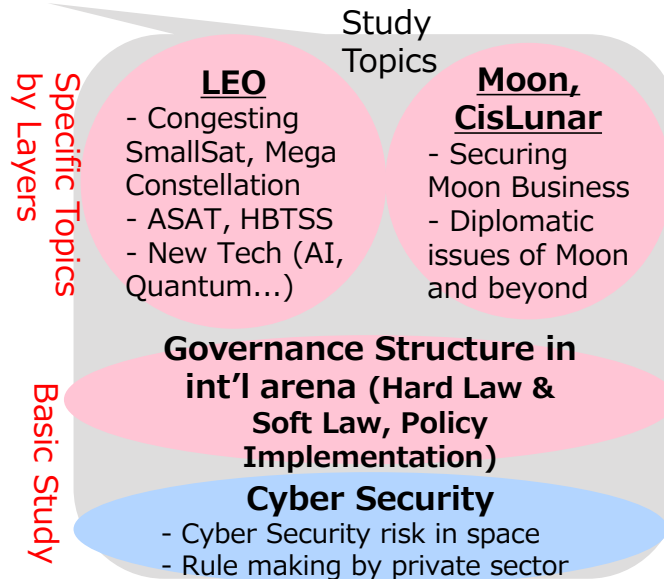
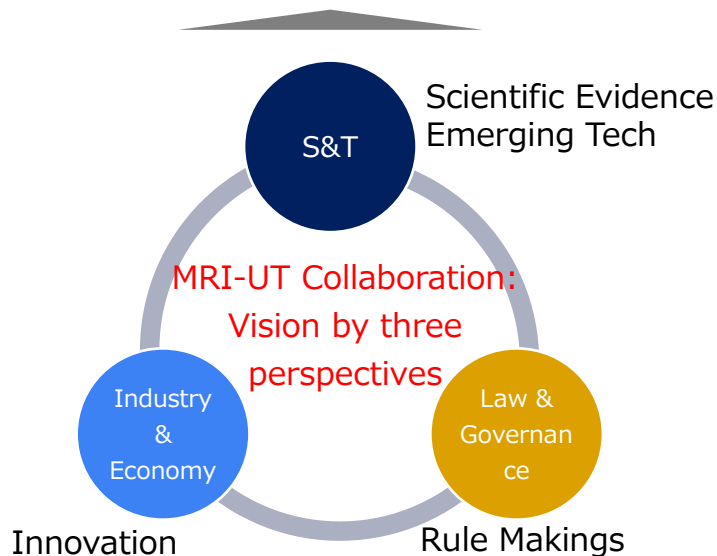
- Safety & Security issues (e.g., ASAT & Debris) – interrelated
  - Example of Russian ASAT
- Emerging Space Activities and new risks & threats (incl. cyber security)
  - Collaborating with the emerging industry – but somehow vulnerable

=> **Need to realize Sustainable Use of Outer Space incl. emerging players looking both safety & security aspects.**

- Ensuring **safety** by **international rule** settings (Cooperation)
  - Promoting **innovation** of each country (Competition)
- => **Sustainable Space** by Cooperation & Competition



Russian ASAT Test Simulation Results (Source: UKSA)



US military constellation to work with the industry (Source: DARPA)

Space Risk Governance Study (JFY2020-2022, funded by MOFA, Japan)

# Summary of FY2021 Achievements

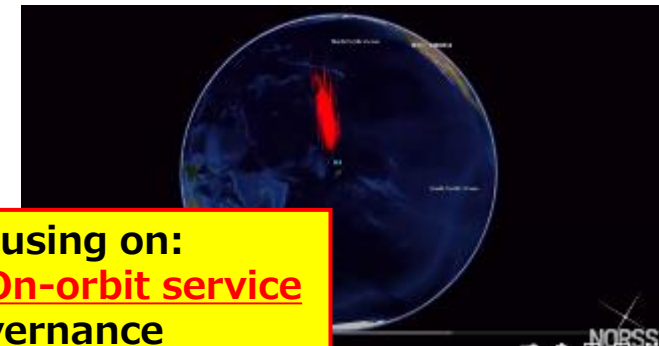
## Emerging Activities and Risks in Outer Space – Need for Sustainability

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  - Example of Russian ASAT
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**Focusing on confidence-building measures ("soft law")**  
 – esp. **global information sharing mechanism**  
**that contributes to safe space activities.**

Outer Space incl.  
 security aspects.

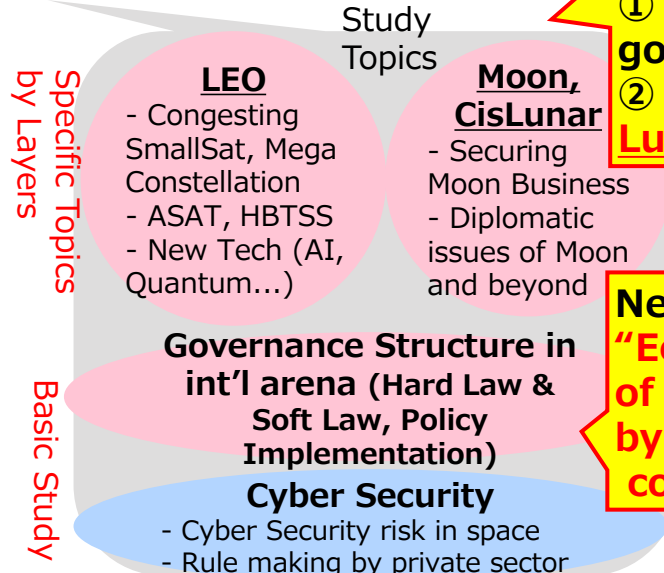
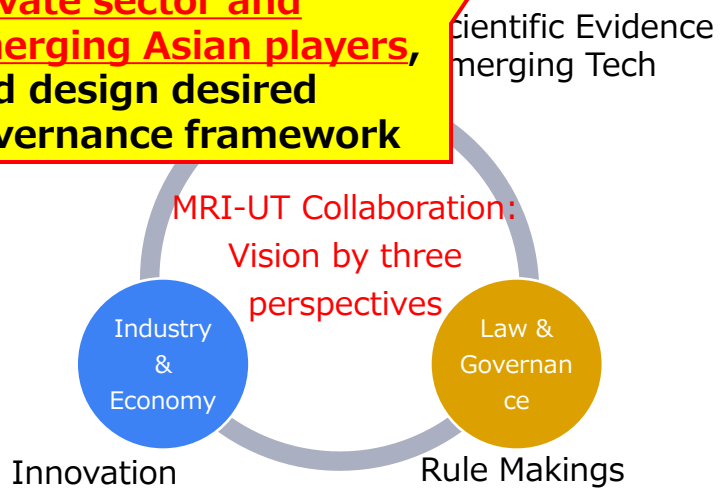
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**Focusing on:**  
 ① **On-orbit service governance**  
 ② **Governance of Lunar development**

Test Simulation (Source: UKSA)

**Risk assessment with private sector and emerging Asian players, and design desired governance framework**



**Newly discuss the "Economic Security" of space activities by international cooperation**



US military constellation to work with the industry (Source: DARPA)

Space Risk Governance Study (JFY2020-2022, funded by MOFA, Japan)

# Key Achievements (FY2021)

## (1) Governance mechanism incl. private-sector perspectives

- Based on the opinions of the Japanese private sector players (assumed risks and expected international rules), conduct a study on the desired governance from the viewpoint of making the activity sustainable.
- Conducted a survey of the private sector (on-orbit service providers and consortium member companies for lunar commercial activities) regarding the expected risks and expected international rules for future space activities. As a result, it was confirmed that "safety" is a common value that is important to all players, and that they are willing to share information and establish a certain level of rules regarding space activities in order to realize this value.

## (2) Involvement of Asia-Pacific regional players

- Hosted a session on "Space Sustainability" at the Asia-Pacific Regional Space Agency Forum (APRSAF), an open forum for space stakeholders in the Asia-Pacific region (co-hosted with the Cabinet Office), and prepared recommendations that included the views of emerging Asian players.
- Through discussions with stakeholders in the Asia-Pacific region, we reaffirmed the need to improve governance mechanisms to ensure the safety and sustainability of space activities, while at the same time ensuring that they do not unduly hinder space development, utilization, and innovation, which can be a source of sustainable growth (a broad and long-term perspective is necessary).

## (3) Outreaching by Young Professionals

- In APRSAF, MRI (Muto) serves as the session chair and plays the role of presentation and coordination at international conferences. Raise position as a leader in discussions in this field.
- Young researchers (Kokubo, Ishii) made presentations at the International Space Technology Society of Japan (ISTS). → Contributed to strengthening the ability of young researchers to communicate in English.
- In addition, outreach through presentations at the Space Science and Technology Association of Japan (the largest space-related meeting in Japan, held online) was conducted again this fiscal year → Contributed to enhancing the awareness of domestic researchers, including young researchers, and the involvement of related parties.

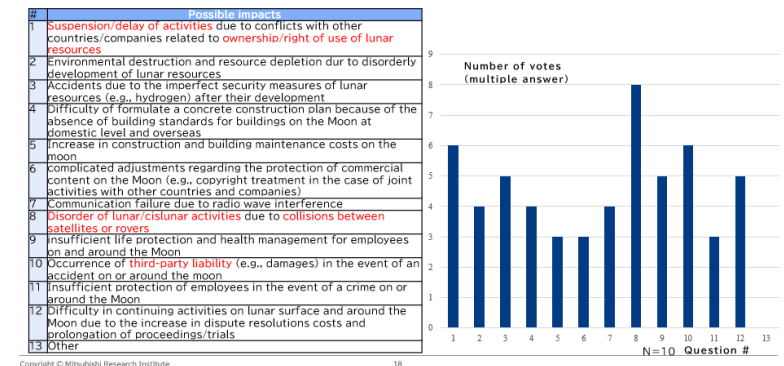
### 2. Study Progress / Governance of Moo Exploration

#### Anticipated impacts

##### - associated with the absence of international rules

###### • Major impacts were:

- Disorder and delay of lunar activities mainly due to conflicts on ownership/right of use of lunar resources and collision between satellites/rovers.
- Occurrence of third-party liability due to accidents on the Moon



### Organizing the Risks and Impacts of the Absence of International Rules in Lunar Development

Source: Mitsubishi Research Institute

13:00-14:15 Space Sustainability (organized by Cabinet Office, The Government of Japan and Mitsubishi Research Institute)

**Session Chair:** Mr. MUTO Masanori, Senior Researcher/Mission Leader (Space & Ocean), Mitsubishi Research Institute (MRI)

**Panel Discussion:** "Future Space Activities and Sustainability in Asia-Pacific region (Governance of LEO, GEO, Moon, and deep space)"

**Panelists:**

- Dr. Ajey Lele, Senior Fellow, IDSA, India
- Ms. Yunita Permalasan, Junior Researcher, LAPAN-BRIN, Indonesia
- Mr. John Mankins, Vice President, The Moon Village Association
- Dr. TAKAYA Yuri, Visiting Researcher, The University of Tokyo, Japan


27TH APRSAF

Space Policy and Law Working Group


**Space Sustainability**

**Session Chair:** MUTO Masanori, Mitsubishi Research Institute (MRI)


- This session aims to discussing the desirable governance mechanism to achieve the sustainable development of outer space especially focusing on ensuring the safety and security of emerging activities by the Asia-Pacific players (including the industry) and agreed on the followings:
- Space governance mechanism need to be enhanced to ensure the safety and stability of outer space but should not hinder the activities of emerging players in the Asia Pacific region considering space is a global commons where every stakeholders could access as a driver of sustainable development (incl. satellite applications for earth observations).
- Transparency and Confidence-Building Measures (TCBM) should be pursued including information sharing mechanism among space faring nations especially for LEO and future activities on the Moon.
- Talking with the industry regarding interoperability and standard is important to ensure the safety and sustainability of space activities considering increasing activities and collaboration with commercial players.
- Continue to discuss the workable governance mechanism where every stakeholder including emerging players (both public and industry) could agree on. For this purpose, open platform like APRSAF/SPLWG is important.
- Consider the governance mechanism workable for future exploration activities beyond LEO (MEO/GEO, Mars, and deep space).




Mr. MUTO Masanori, MRI




Dr. Ajey Lele, IDSA



Ms. Yunita Permalasan, LAPAN-BRIN



Mr. John Mankins, The Moon Village Association



Dr. TAKAYA Yuri, The University of Tokyo

### APRSAF Space Law and Policy WG "Space Sustainability" session (co-hosted by the Cabinet Office and MRI) Recommendations

Source : APRSAF-27 [https://www.aprsaf.org/working\\_groups/spl/pdf/AP27\\_Agenda.pdf](https://www.aprsaf.org/working_groups/spl/pdf/AP27_Agenda.pdf)  
[https://www.aprsaf.org/working\\_groups/spl/pdf/AP27\\_Report.pdf](https://www.aprsaf.org/working_groups/spl/pdf/AP27_Report.pdf)

# Major Findings and Suggestions (FY2021)

Items	Study conclusions and implications for diplomatic policy	Issues to be addressed
Common	<ul style="list-style-type: none"> <li>■ [Analysis] <u>New risks are emerging due to technological advances and the diversification and complexity of stakeholders, including the private sector</u> (e.g., cyber risk for commercial spacecraft). Governance based on this change is necessary.</li> <li>■ [Implication] In the space sector, which is constantly changing, it is important to <u>lead the way in strengthening "soft law," which is expected to quickly and flexibly build consensus, in a way that can protect and support Japan's private-sector activities</u>. As a concrete tool for "soft law," we focus on <u>transparency assurance and confidence-building measures through information sharing mechanisms</u>.</li> </ul>	<ul style="list-style-type: none"> <li>■ In addition to the private sector, it is necessary to make the agreement feasible and agreeable by <u>involving countries with conflicting interests as well as emerging countries in Asia and other regions that are planning to enter the market in the future</u>.</li> </ul>
1) On-orbit Servicing Governance	<ul style="list-style-type: none"> <li>■ [Analysis] New services such as debris recovery, satellite refueling, and repair using robotic arms (i.e., on-orbit services) are emerging in low earth orbit, mainly by the space powers (including the private sector as well as the public sector) of the U.S., Europe, China, Russia and Japan, and there is <u>a need for an international framework for the safe operation and management of such services</u> (confirmed through exchange of opinions with domestic operators).</li> <li>■ [Suggestion] As a mechanism to prevent safety risks of on-orbit service satellites (accidents, cyber attacks) and possible threats of satellite attacks using the same technology, it is useful to <u>strengthen information sharing (mutual disclosure and sharing of on-orbit activities) as a first step to increase transparency among major countries</u>. In addition to the existing Space Situational Awareness (SSA) information, it is necessary to establish a mechanism for <u>sharing activity plans prior to the implementation of on-orbit services and sequential sharing of information on orbit changes and maneuvers</u>. <u>Japan's domestic guidelines already include such elements, and internationalization of these guidelines</u> is a possibility.</li> </ul>	<ul style="list-style-type: none"> <li>■ Concrete guidelines that can be agreed upon by each country.</li> <li>■ Continue to work with international private organizations such as CONFERS.</li> </ul>
2) Lunar Development Governance	<ul style="list-style-type: none"> <li>■ [Analysis] Japan is participating in the U.S.-led Artemis Program to develop the Moon, and <u>Japanese private companies are expected to develop commercial activities on the Moon</u> in the future (not limited to resource exploration, but also including a wide range of services such as construction and food supply on the premise of human habitation). It is necessary to <u>establish an international framework for avoiding and resolving the risks of accidents, resource and environmental management, and conflicts</u>. In fact, previous studies have <u>confirmed Japanese companies' concerns about the risks of lunar activities and their needs for a framework to ensure their safety</u>.</li> <li>■ [Suggestion] It is considered useful to establish <u>a mechanism to ensure transparency through information sharing for the purpose of ensuring safety</u>. According to a survey conducted by MRI on Japanese companies, most respondents were positive.</li> </ul>	<ul style="list-style-type: none"> <li>■ Specific consideration of information to be shared and operational methods.</li> <li>■ Consideration of mechanisms that can be agreed upon by major stakeholders, including China and Russia.</li> <li>■ Continue to collaborate with international private organizations such as the Moon Village Association.</li> </ul>