Legal Aspects of Space Debris Mitigation
2022 Clean Space Industry Days

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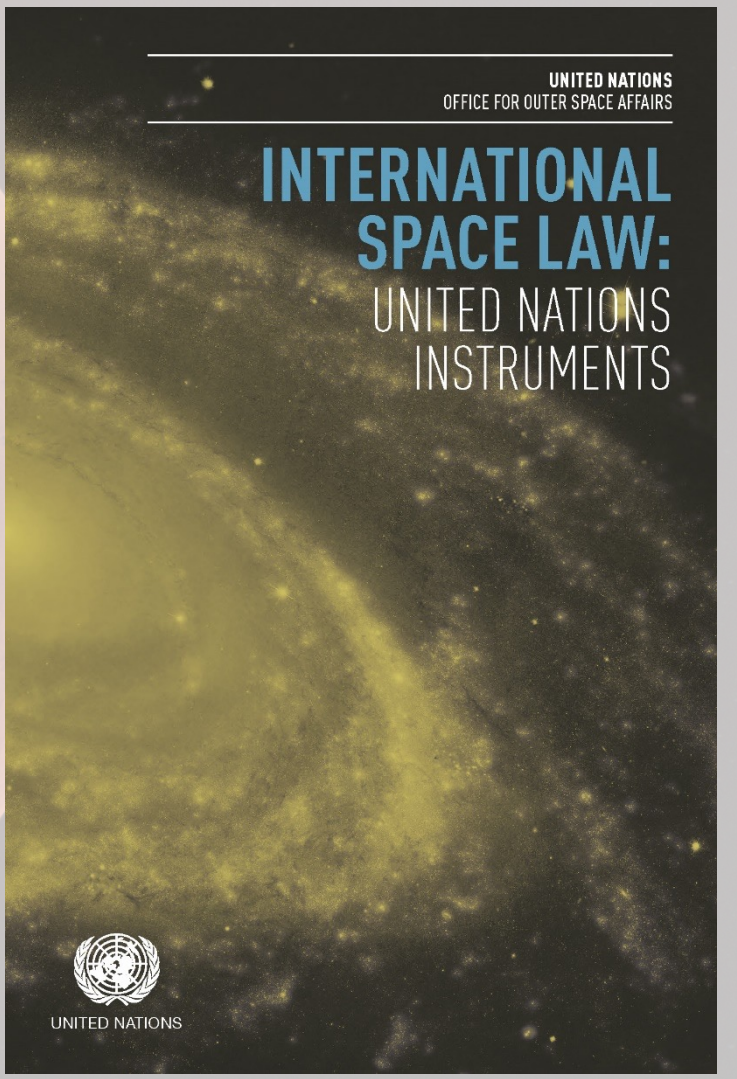
The Outer Space Treaty

- Magna Charta of Outer Space
- 112 Signatories (2022)

- Article I: **Freedom** to explore and use outer space
- Article VI: State **Responsibility**
- Article VII: **Liability** for damage caused by space objects
- Article VIII: **Jurisdiction**, **Control** and **Ownership**
- Article IX Sentence 1 & 2: **Environmental protection**, **avoid harmful contamination** and **due regard**
  - Legally binding, but not clear
  - Neither expressly prohibits the creation of space debris nor imposes an obligation on states and their space actors to remove space objects from orbit



The Liability Convention (LIAB) I

- ESA has accepted the rights and obligations under the LIAB
  - **Damage**: "…loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of person, natural or juridical, or property of international intergovernmental organisations"
- **Launching "State":**
- (i) A State which **launches** or **procures** the launching of a space object
- (ii) A State from whose **territory** or **facility** a space object is launched
- **Procuring a launch**: no clear definition, relates to the order or contracts for the launch of a space object
  - Needs to be interpreted broadly

The Liability Convention (LIAB) II

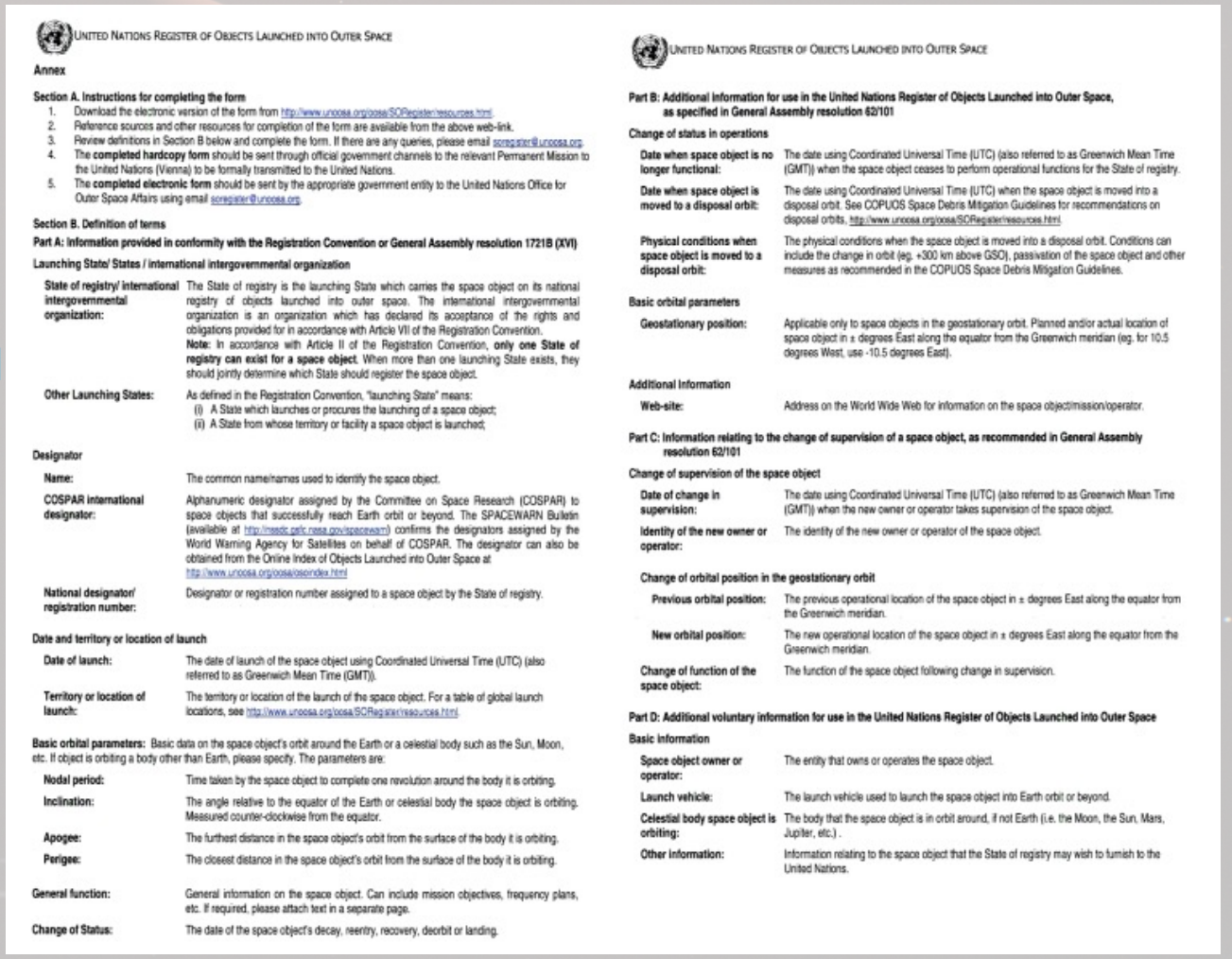
- Article II – **Absolute liability**: "*A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight.*"
- Article III – **Fault-based liability**: "*In the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property onboard such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible*."

- **Space Object**: "…includes component parts of a space object as well as its launch vehicle and parts thereof"

= States (also ESA and its Member States) are **responsible and liable** for any damage caused by a space object, including that caused by private actors.

The Registration Convention (REG)

- ESA has accepted the rights and obligations under the REG
- Article II:
  - Establishment of **a national registry**
  - Register space object once launched
- Article IV: **Notification to the UN Secretary General** "upon launch" - UNOOSA Online Index of Space Objects
- Legal effect: with the act of registration, a State retains jurisdiction and control over the space object
- Non-governmental actors cannot register nor notify
- "ESA Space Object Registration Policy" (2014)
  - a) ESA assets embarked on an ESA or non-ESA launch, entering orbit
  - b) Launcher stages for launches under an ESA development programme



UNITED NATIONS REGISTER OF OBJECTS LAUNCHED INTO OUTER SPACE

Annex

Section A. Instructions for completing the form

1. Download the electronic version of the form from http://www.unoosa.org/oosa/SORegister/resources.html.
2. Reference sources and other resources for completion of the form are available from the above web-link.
3. Review definitions in Section B below and complete the form. If there are any queries, please email soregister@unoosa.org.
4. The **completed hardcopy form** should be sent through official government channels to the relevant Permanent Mission to the United Nations (Vienna) to be formally transmitted to the United Nations.
5. The **completed electronic form** should be sent by the appropriate government entity to the United Nations Office for Outer Space Affairs using email soregister@unoosa.org.

Section B. Definition of terms

Part A: Information provided in conformity with the Registration Convention or General Assembly resolution 1721B (XVI)

Launching State/ States / international intergovernmental organization

State of registry/ international intergovernmental organization:	The State of registry is the launching State which carries the space object on its national registry of objects launched into outer space. The international intergovernmental organization is an organization which has declared its acceptance of the rights and obligations provided for in accordance with Article VII of the Registration Convention. **Note:** In accordance with Article II of the Registration Convention, **only one State of registry can exist for a space object**. When more than one launching State exists, they should jointly determine which State should register the space object.
Other Launching States:	As defined in the Registration Convention, "launching State" means: (i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched;

Designator

Name:	The common name/names used to identify the space object.
COSPAR international designator:	Alphanumeric designator assigned by the Committee on Space Research (COSPAR) to space objects that successfully reach Earth orbit or beyond. The SPACEWARN Bulletin (available at http://nssdc.gsfc.nasa.gov/spacewarn/) confirms the designators assigned by the World Warning Agency for Satellites on behalf of COSPAR. The designator can also be obtained from the Online Index of Objects Launched into Outer Space at http://www.unoosa.org/oosa/oosoindex.html
National designator/ registration number:	Designator or registration number assigned to a space object by the State of registry.

Date and territory or location of launch

Date of launch:	The date of launch of the space object using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)).
Territory or location of launch:	The territory or location of the launch of the space object. For a table of global launch locations, see http://www.unoosa.org/oosa/SORegister/resources.html.

Basic orbital parameters: Basic data on the space object's orbit around the Earth or a celestial body such as the Sun, Moon, etc. If object is orbiting a body other than Earth, please specify. The parameters are:

Nodal period:	Time taken by the space object to complete one revolution around the body it is orbiting.
Inclination:	The angle relative to the equator of the Earth or celestial body the space object is orbiting. Measured counter-clockwise from the equator.
Apogee:	The furthest distance in the space object's orbit from the surface of the body it is orbiting.
Perigee:	The closest distance in the space object's orbit from the surface of the body it is orbiting.
General function:	General information on the space object. Can include mission objectives, frequency plans, etc. If required, please attach text in a separate page.
Change of Status:	The date of the space object's decay, reentry, recovery, deorbit or landing.

UNITED NATIONS REGISTER OF OBJECTS LAUNCHED INTO OUTER SPACE

Part B: Additional information for use in the United Nations Register of Objects Launched into Outer Space, as specified in General Assembly resolution 62/101

Change of status in operations

Date when space object is no longer functional:	The date using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)) when the space object ceases to perform operational functions for the State of registry.
Date when space object is moved to a disposal orbit:	The date using Coordinated Universal Time (UTC) when the space object is moved into a disposal orbit. See COPUOS Space Debris Mitigation Guidelines for recommendations on disposal orbits. http://www.unoosa.org/oosa/SORegister/resources.html
Physical conditions when space object is moved to a disposal orbit:	The physical conditions when the space object is moved into a disposal orbit. Conditions can include the change in orbit (eg. +300 km above GSO), passivation of the space object and other measures as recommended in the COPUOS Space Debris Mitigation Guidelines.

Basic orbital parameters

Geostationary position:	Applicable only to space objects in the geostationary orbit. Planned and/or actual location of space object in ± degrees East along the equator from the Greenwich meridian (eg. for 10.5 degrees West, use -10.5 degrees East).

Additional information

Web-site:	Address on the World Wide Web for information on the space object/mission/operator.

Part C: Information relating to the change of supervision of a space object, as recommended in General Assembly resolution 62/101

Change of supervision of the space object

Date of change in supervision:	The date using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)) when the new owner or operator takes supervision of the space object.
Identity of the new owner or operator:	The identity of the new owner or operator of the space object.

Change of orbital position in the geostationary orbit

Previous orbital position:	The previous operational location of the space object in ± degrees East along the equator from the Greenwich meridian.
New orbital position:	The new operational location of the space object in ± degrees East along the equator from the Greenwich meridian.
Change of function of the space object:	The function of the space object following change in supervision.

Part D: Additional voluntary information for use in the United Nations Register of Objects Launched into Outer Space

Basic information

Space object owner or operator:	The entity that owns or operates the space object.
Launch vehicle:	The launch vehicle used to launch the space object into Earth orbit or beyond.
Celestial body space object is orbiting:	The body that the space object is in orbit around, if not Earth (i.e. the Moon, the Sun, Mars, Jupiter, etc.) .
Other information:	Information relating to the space object that the State of registry may wish to furnish to the United Nations.

From UNOOSA Register of Objects Launched

The Registration Convention (REG) II

- **Joint launches**: whenever two or more States launch a space object, each State is independently liable to fully compensate
  - Launching States therefore usually agree on the apportionment of liability
- ESA: **Resolution of the Council of the European Space Agency on the Agency's Legal Liability** (1977) ESA/C/XXII/Res.3
  - Article III para.3: "Irrespective of any ceiling agreed upon with respect to their participation, the expenditure made by the Agency in respect of compensation for damage *will be charged to the States participating in the programme concerned, proportionately to their financial contributions to the said programme*…"

Launching 'State' | Space Object | Damage = Absolute Liability / 'Fault' Liability

National Space Law (NSL)

- NSL as the continuation, concretion and completion of international space law
- **Only legally binding instrument** currently applicable in the context of space debris mitigation on a national level are **national space laws and regulations**
- Two options:
  - Specific rules: e.g. France, Austria
  - Generic (referring either to for example IADC SDM, UN COPUOS SDM Guidelines and/or standards): e.g. Finland, Belgium

IADC Space Debris Mitigation Guidelines

- Inter-Agency Space Debris Coordination Committee

- 2002, 2020, 2021
- Defines the term '**space debris**' as "…*all man made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional*."
  - Post mission disposal: 25 year re-entry rule & 90% success rate
  - Limit debris released during normal operations
  - Minimise the Potential for On-Orbit Break-ups
  - Prevention of On-Orbit Collisions

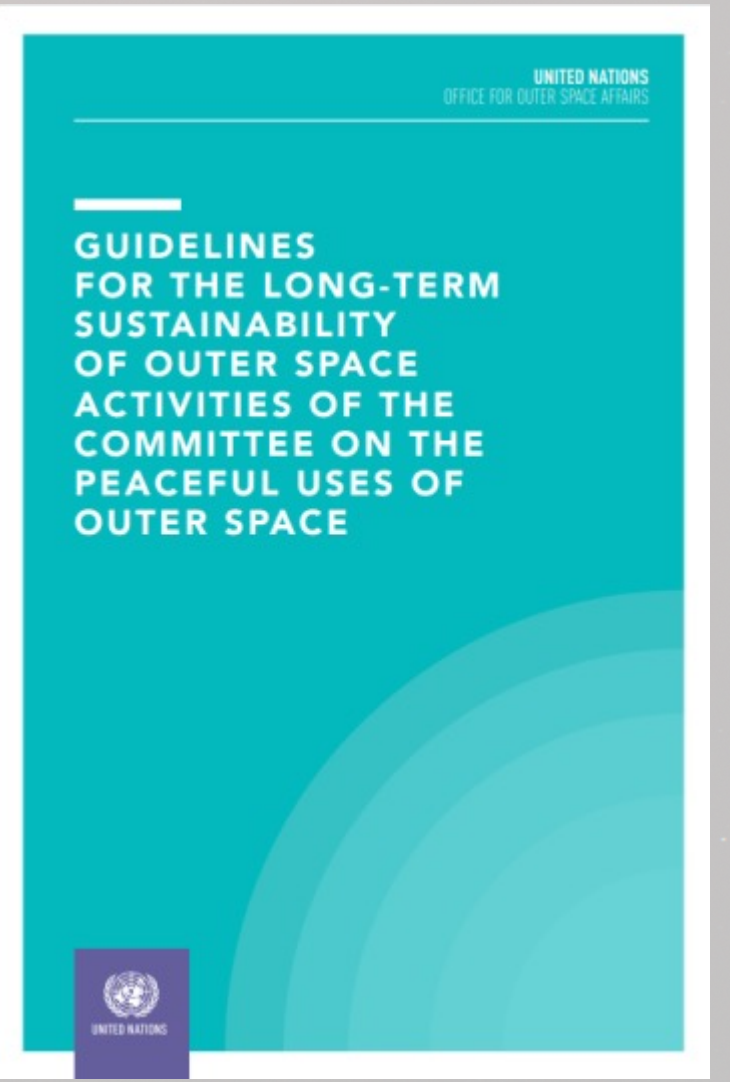
UN COPUOS Space Debris Mitigation Guidelines

- United Nations Committee on the Peaceful Uses of Outer Space
- 2007, endorsed also by the UN General Assembly
- Based on the IADC SDM Guidelines
- & makes reference to the latest IADC SDM Guidelines for more “in-depth descriptions and recommendations”
- In principle no retroactive effect

“*Member **States** and **international organisations should voluntarily take measures**, through national mechanisms or through their own applicable mechanisms, to ensure that these guidelines are implemented, to the greatest extent feasible, through space debris mitigation practices and procedures*.”

UN COPUOS Guidelines for the Long-term Sustainability of Outer Space Activities (LTS Guidelines)

- 2019
- Newest Guidelines on UN level to address amongst other aspects also space debris mitigation
- **Implement space debris mitigation measures**, such as the Space Debris Mitigation Guidelines…
- Promote the **collection, sharing and dissemination of space debris monitoring information**
- Design and operation of space objects regardless of their physical and operational characteristics
- Take measures to address **risks associated with the uncontrolled re-entry** of space objects
- Investigate and **consider new measures** to manage the space debris population in the long-term



Non-legally binding instruments

- **Space Law**:
  - (State) Responsibility, (State) Liability
  - Authorisation, Supervision
  - Avoid harmful contamination & act with due diligence

Binding, however no clear rules on space debris!

- **National Space Law & Regulations:**
  - Legally binding
  - International reputation = increased implementation of SDM guidelines and standards

Binding, however only on national activities = Fragmentation?

- **Non-legally binding instruments:**
  - More than four decades without new binding treaty law
  - Non-legally binding instruments (= "**soft law**") as alternative
  - Increasing political relevance

Functions:

- Substitute for treaty law
- Addressing current issues
- Implementation into national law = binding on national level
- Customary International Law?

Not binding, however political (legal) effect!

ESA's Space Debris Policy

- Since 2008, own space debris mitigation policy, revised in 2014
- "Space Debris Mitigation Policy for Agency Projects" (ESA/ADMIN/IPOL(2014)2)
  - *available to the public
- The ESA SDM Policy contains management, design and operational requirements
  - Since 8 March 2022 ESA Standard: ECSS-U-AS-10C rev.1 - for all space systems prior: ECSS-U-AS-10
- ISO (International Organization for Standardization)
  - ISO 24113:2019 (revised every 5 years)
- ECSS (European Cooperation for Space Standardization)
  - Adopts the ISO 24113:2019 without any modifications, but with clarifications

ISO 24113:2019

- Limit the ejection of slag from solid rocket motors
- 90% probability of successful disposal
- Collision avoidance (mandatory) for all GEO spacecrafts. For LEO only requirement for those that have a manoeuvering capability
- Impact risk assessment
- No longer option of disposal of a LEO object above the LEO region (2011)
- Clearer definition of the 25-year rule
- Limit the number of debris objects released by a launch vehicle

ESA's Space Debris Policy - Application

- The ESA Space Debris Mitigation Policy for Agency Projects shall apply to:
  1) The procurement of ESA space systems (e.g. launchers, satellites, inhabited or robotic vehicles)
  2) Operations, under the responsibility of ESA, of any given space system
  3) For the procurement of launch services for ESA Space Systems, all reasonable efforts shall be made to ensure the use of launchers which are compliant with the SDM requirements

What is an ESA mission?

Every ESA mission falls under an ESA programme, but not everything called "programme" is an ESA mission – example Fly Your Satellite "Programme"

The (legal) future… for zero debris

- ESA **is not** a regulatory body (and can therefore neither impose rules on its MS, nor on industry)
- ESA can however advise and help Member States implement current guidelines and standards
  - **Council mandate for ESA** to assist Member States with implementing space law on a national level (national space laws and regulations) (ESA/C-M/CCLXIV/Res.1(Final))

- Foster and promote current applicable laws and guidelines
- Update current SDM Policy to be even more forward thinking .. Moving towards zero debris?
- Support industry to come up with technical solutions for an innovative way forward

- The legal effect (of international organisations)?
- Customary rule?