



Legal Aspects of Planetary Protection

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Outer Space Treaty Article IX

In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by **the principle of cooperation and mutual assistance** and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with **due regard** to the **corresponding interests** of all other States Parties to the Treaty.

States Parties to the Treaty **shall pursue studies** of outer space, including the Moon and other celestial bodies, **and conduct exploration** of them **so as to avoid their harmful contamination** and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, **shall adopt appropriate measures** for this purpose.

Outer Space Treaty Article IX

If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.

A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.

General Principles from Article IX

- Cooperation and mutual assistance . (Sentence 1)
- Due regard to the corresponding interests of other States Parties. (Sentence 1)

Positive Obligations from Article IX

- Adopt appropriate measures (where necessary) to pursue studies/conduct exploration of space so as to avoid harmful contamination. (Sentence 2)
- Pursue studies/conduct exploration which DOES avoid harmful contamination (Sentence 2).
- Undertake international consultations when your planned activities might cause potentially harmful interference to other's activities. (Sentence 3)
- May request consultations with other States, when their activities threaten harmful interference. (Sentence 4)

Outer Space Treaty Article VI

States Parties to the Treaty **shall bear international responsibility for** national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, **and for assuring** that national activities are carried out in conformity with the provisions set forth in the present Treaty.

The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, **shall require authorization and continuing supervision** by the appropriate State Party to the Treaty.

When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

Positive Obligations from Article VI

Regarding national non-governmental space activities,
States are under a positive obligation (a duty to perform)

- Authorize
- Continually supervise
- Assure conformity with int'l law;
- Bear international responsibility for

Whether or not this was true in 1967, it is certainly no longer true today

1. Articles VI and IX of the Outer Space Treaty have been “executed” on a national regulatory level, regarding commercial space, *via*:
 - a. United States Code (USC) Title 51, Chapter 509 Commercial Space Launch Activities;
 - b. and its implementing regulation, the Code of Federal Regulations (CFR) Title 40 Chapter III-Subchapter C. Licensing

1. Under international law, the US is bound by the OST, and is internationally responsible for non-governmental space activities.
 - a. A defect of national, municipal regulation is not an excuse under int’l law. (See Art. 27 of the Vienna Convention on the Law on Treaties “A party may not invoke the provisions of its internal law as justification for its failure to perform a treaty” or Art. 3 of the Articles on State Responsibility).

C.F.R. § 415.57 Payload review

(a) *Timing.* A payload review may be conducted as part of a license application review or may be requested by a payload owner or operator in advance of or apart from a license application.

(b) *Interagency consultation.* The FAA consults with other agencies to determine whether launch of a proposed payload or payload class would present any issues affecting public health and safety, safety of property, U.S. national security or foreign policy interests, or **international obligations of the United States**.

- (1) The FAA consults with the Department of Defense to determine whether launch of a proposed payload or payload class would present any issues affecting U.S. national security.
- (2) **The FAA consults with the Department of State to determine whether launch of a proposed payload or payload class would present any issues affecting U.S. foreign policy interests or international obligations.**
- (3) The FAA consults with **other federal agencies, including the National Aeronautics and Space Administration**, authorized to address issues identified under paragraph (b) of this section associated with an applicant's launch proposal.

C.F.R. §415.59 Information requirements for payload review

- (a) A person requesting review of a particular payload or payload class shall identify the following:
- (1) Payload name;
 - (2) Payload class;
 - (3) Physical dimensions and weight of the payload;
 - (4) Payload owner and operator, if different from the person requesting payload review;
 - (5) Orbital parameters for parking, transfer and final orbits;
 - (6) Hazardous materials, as defined in §401.5 of this chapter, and radioactive materials, and the amounts of each;
 - (7) Intended payload operations during the life of the payload; and
 - (8) Delivery point in flight at which the payload will no longer be under the licensee's control.
- (b) [Reserved]

Why/How are the PP guidelines applicable to commercial actors?

NASA NPR (NASA Procedural Requirements) 8020.12D

P.2 Applicability

a. This NPR is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the Jet Propulsion Laboratory, a Federally Funded Research and Development Center, and other contractors, grant recipients, or parties to agreements to the extent specified or referenced in the appropriate contracts, grants, or agreements.

https://nods3.gsfc.nasa.gov/npg_img/N_PR_8020_012D_/N_PR_8020_012D_.pdf

Even then, it's not clear....

We literally have to look at the actions of the FAA to see incorporation of NASA PP guidelines into their payload determination...

Additional Information

SpaceIL identified in its application that the mission is classed as a Mission Category II in accordance with the NASA Planetary Protection Mission Categories document. SpaceIL stated that it would provide documents upon need to FAA/AST, NASA, or other regulation bodies based on NPR 8020.109A as may be requested during the payload review process.

—Federal Aviation Administration, SpaceIL Payload Review and Determination Letter, July 30, 2018,
<http://bit.ly/2r79HnK>

However, this is likely because of the novelty of commercial missions giving rise to PP concerns

“The law has limits. The law can take us so far; but beyond a certain point we are, as it were, on our own.

There is the limitation imposed by what we might call the ‘grain’ of international law.

You cannot continue indefinitely to ask more and more detailed questions and expect to get a legal answer. There is a limit to the level of detail in which every legal question can be answered.

The fact is that legal rules are not infinitely precise. There is always room for a marginal case, to which the application of the rules is unclear.”

Vaughan Lowe, 2016

Hague Academy of International Law, *The Limits of the Law* Recueil des Cours, Tome 379.

EMERGENT DEFICIENCIES

(gaps/*lacunae* & lack of clarity/ *non liquet*)

Sometimes not found in the law itself, but can emerge as space activities develop, and we question how these activities are regulated by the existing laws.

— We look to the law, and are not given a clear signal as to an activity's legality.

Planetary protection isn't explicitly addressed and regulated with total clarity in OST Art. IX; the FAA launch & payload licenses don't mention organisms.

I believe that -this is not an INTENTIONAL refraining by the drafters, it is because space activities developed beyond what the drafters imagined.

DANIEL OBERHAUS

SCIENCE 00.05.2019 06:55 PM

A Crashed Israeli Lunar Lander Spilled Tardigrades on the Moon

The Beresheet lunar lander carried thousands of books, DNA samples, and a few thousand water bears to the moon. But did any of it survive the crash?



'I'm the first space pirate!' How tardigrades were secretly smuggled to the moon

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'Water bears' are now on the moon – but nobody told the space agency that took them.

IMAGE: SCIENCE PICTURE CO/ASA

BY CHRIS TAYLOR

AUG 08, 2019

For the last four months, Nova Spivack has been busting with a cosmic secret he couldn't tell the world. And even if he did, he knew it would sound implausibly Star Wars-esque.



The Beresheet lunar lander being prepared for launch. Unbeknownst to SpaceIL, the "Lunar Library" payload on the lander provided by the Arch Mission Foundation included tardigrades, setting off a space law controversy when their presence was ultimately disclosed. (credit: IAI)

The curious case of the transgressing tardigrades (part 1)

by Christopher D. Johnson, Daniel Porras, Christopher M. Hearsey, and Sinead O'Sullivan
Monday, August 26, 2019



The Curious Case of the Transgressing Tardigrades is still developing, but this essay (the first of two parts) attempts to collect in one place various perspectives on the issues involved. These perspectives include an international legal context of the situation, domestic regulatory and business perspectives, geopolitical and diplomatic implications, as well as a basic discussion of the astrobiological norms and social considerations which shape and inform the previous topics.

This incident is important because it is a glimpse of things to come, a near future where space actors will be more autonomous and independent of governmental oversight and intrusion, where scientific concerns like planetary protection sit uneasily with commercial interests, where national and international norms appear increasingly outdated, and where the visions and actions of space "pioneers" and space "colonizers" are frankly not the only voices that matter.

Background of the Beresheet mission

The Beresheet mission to the Moon was launched on February 22, 2019, and was envisioned as a landmark achievement and national triumph for Israel. Despite the mission stumbling right before touchdown on the lunar surface (see "If at first you don't succeed...", The Space Review, April 15, 2019), it is certainly a technological accomplishment that Israel (the self-styled "start-up nation") can be proud of. The Beresheet lunar lander mission ought to be remembered as a great first attempt by Israel to reach and explore the Moon, something only a handful of nations has achieved. However, it's now coming to light that this mission may be remembered for something more unsettling.

The Arch Mission Foundation, a non-profit organization concerned with "backing up" humanity by sending DNA and cultural artifacts to space.

Unfortunately, this is not the first time someone seems to have launched



The Beresheet lunar lander being prepared for launch. Unbeknownst to SpaceIL, the "Lunar Library" payload on the lander provided by the Arch Mission Foundation included tardigrades, setting off a space law controversy when their presence was ultimately disclosed. (credit: IAI)

The curious case of the transgressing tardigrades (part 2)

by Christopher D. Johnson, Daniel Porras, Christopher M. Hearsey, Sinead O'Sullivan, and Monica Vidaurri
Tuesday, September 3, 2019



The Curious Case of the Transgressing Tardigrades is still developing, but this essay (the second in a series) attempts to collect various perspectives on the issues involved. In part one, after a recitation of the facts (as we know them, based on what is publicly available), we discussed the international legal context and applicable space law, some business perspectives, and basic tenets of astrobiology and planetary protection. In this part, we delve deeper into domestic US regulation via the FAA's payload review process, and how it might have operated in the Beresheet mission.

US national oversight of commercial space activities

To shed light on the ramifications and possible outcomes from this curious case of the transgressing tardigrades, we now look to US national space law. Since the proliferation of obtuse counter-arguments about international law and its applicability to SpaceIL's Beresheet lunar lander mission have failed to adequately address the severity of the situation, let us review the central questions under which US national space law sheds light on the interplay between national and international space law, and how a violation of federal law would not produce workable outcomes for commercial space actors.

As a matter of federal law, the central questions in the discourse below are:

- How does the US government authorize and continuously supervise the launch of a payload?
- How does the US government maintain jurisdiction and control over payloads?
- How does the US government evaluate its risk from commercial space activities under US national space law?

General/Overarching Findings and Recommendations from the NASA PP IRB report

Major Finding: There is a general lack of clarity concerning PP requirements and implementation processes, particularly for non-NASA missions; this impedes the development of private sector planetary exploration.

Major Recommendation: NASA should clarify its policy for exercising PP authority over primarily non-NASA space activities that have some level of NASA involvement.

Major Recommendation: To further encourage the development of private sector planetary activities, NASA should offer a greater degree of PP expertise and tools to new and emerging actors in planetary exploration.

- Page 10 of the report

- This is an excellent finding and recommendation. It's impossible to eliminate the possibility of bad actors, but at least the commercial community can be INFORMED.
 - Informed both about the rationale and technical details about PP, AND about the consequences of violation of the rules.

General/Overarching Findings and Recommendations from the NASA PP IRB report

Major Finding: Although NASA is not a regulatory agency, the Agency can likely affect control over non-NASA U.S. missions by linking PP compliance to eligibility for current or future NASA business or NASA support. However, overreaching application of such control could result in reduced opportunities for collaboration with private sector missions.

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Supporting Recommendation: NASA should provide external stakeholders with clear information and better insight and outreach on its PP standards and processes. This should include a rollout plan for new PP processes, followed by regular stakeholder engagement opportunities to ensure widespread awareness and understanding of PP standards and processes.

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- More useful findings. These tie to the previous slide, where the commercial sector has an incentive to learn the requirements of PP, and to adhere to them.

General/Overarching Findings and Recommendations from the NASA PP IRB report

Supporting Finding: It is impractical for launch providers or satellite hosts to definitively determine the biological content of every payload. Biological materials intentionally added by a bad actor are especially challenging for launch providers to monitor or report, as they can be further obscured by falsified verification or inaccurate documentation. The recent experience in which a launch customer placed tardigrades and other biological samples on the Spacell Beresheet lunar lander is illustrative. By the Moon's Category II PP designation, it is likely that a payload license would have been readily granted had the bioload been self-reported; however, the lack of such reporting created new issues relating to launch licensing.

Supporting Recommendation: Breaches of PP reporting or other requirements should be handled via sanctions that hold the root perpetrator accountable, rather than increasing the verification and regulatory burden on all actors.

Supporting Finding: Space Act Agreements and some NASA contracts require NASA 8020.12 PP compliance, which in turn invokes COSPAR policy/guidelines.

Supporting Recommendation: These contractual requirements should be reviewed by NASA to simplify compliance where possible and to avoid overconstraining the means of meeting NASA intent.

Supporting Recommendation: Whenever updating U.S. PP policy and implementation practices, the U.S. government should work with the United Nations (UN) Committee on the Peaceful Uses of Outer Space (COPUOS) to communicate new U.S. PP approaches to the international community, share best practices, and encourage the international community to address such issues.

Sanctions CAN have a deterring effect. But the damage will have already been done!

Private Sector Initiatives and Missions

Major Recommendation: PP-related authorization and supervision across the U.S. government should be implemented in a transparent, timely, and predictable manner, minimizing costs and burdens on private sector activities where possible.

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Supporting Recommendation: For space activities without significant NASA involvement (including private sector robotic and human planetary missions), NASA should work with the Administration, the Congress, and private sector space stakeholders to identify the appropriate U.S. Government agency to implement a PP regulatory framework. This regulatory framework should take into account the nation's exploration, scientific, commercial, and national security interests, and should provide external stakeholders with clear information, including better insight and outreach on PP standards and processes.

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An approaching issue

the astrobiologist's interest in search for life

versus

the private sector's interest in space development

this is analogous to the current debate about 'megaconstellations'

Individual actors in space

versus

other users of space

An approaching issue

How are these interests to be balanced?
Who does the balancing?

For PP, there might be certain locations where science interests predominate .

Elsewhere, perhaps other interest take precedence.

Thank you!

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REFERENCES and SUGGESTED READING

Legal Sources

- United States Code (USC) Title 51 National and Commercial Space Programs Chapter 509 Commercial Space Launch Activities
- Code of Federal Regulations (CFR) Title 14 Chapter III- Part 415 -Launch Licenses
- NASA NPR 8020.12D, Planetary Protection Provisions for Robotic Extraterrestrial Missions, <https://go.nasa.gov/3362e5j>
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- Major John S. Goehring, *Properly Speaking, the United States Does Have an International Obligation to Authorize and Supervise Commercial Space Activity*, 78 Air Force Law Review (2018), <https://ssrn.com/abstract=3159689>
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Part 2 (Sept. 3) <https://www.thespacereview.com/article/3786/1>
- Daniel Oberhaus, *A Crashed Israeli Lunar Lander Spilled Tardigrades on the Moon*, Wired, May 8, 2019, <http://bit.ly/33XsMqV>
- Chris Taylor, *I'm the First Space Pirate! How Tardigrades Were Secretly Smuggled to the Moon*, Mashable, Aug. 8, 2019, <http://bit.ly/2OkAchq>

In fact, being, as we are, only on the threshold of the law of tomorrow, we should give the rules already in existence a very extensive interpretation and see to it that those to come fully implement these basic objectives.

In shaping the law of outer space, as indeed of international law in general, the jurist has an important task to perform. It is not only the framing of technical treaty clauses, not only the analysis of documents. It is much more: he is called upon to make law progress and move, to mould it in the interests of men and nations, to guarantee the protection of law to the great achievements of the past and present, to remove threats to our survival, to strive for a progressive law of tomorrow.

Manfred Lachs, 1964

Hague Academy of International Law, *The International Law of Outer Space*, Recueil de Cours, Tome 113.