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The Lunar Ledger: a global database of lunar objects and activities

Conference room paper by the Open Lunar Foundation

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The Lunar Ledger:
A Global Database of Lunar Objects and Activities

I. Summary

1. This paper is submitted by the Open Lunar Foundation, a U.S. 501c3 independent non-profit organisation and permanent observer to the Committee, committed to operating globally to support the enabling of a peaceful, cooperative, and sustainable lunar future through policy and infrastructure development.

2. As lunar activity accelerates—with over 100 missions projected by 2030, involving more than 20 space agencies and dozens of private entities—the need for effective global coordination, transparency, and operational safety becomes increasingly urgent. Potential conjunction events in lunar orbit are increasing with the influx of lunar missions. Data presented to the Scientific and Technical Subcommittee in June 2024 show that the Korea Pathfinder Lunar Orbiter (Danuri) triggered 41 "Red-Alarm" high-risk conjunction warnings between 19 February 2023 and 7 May 2024, prompting four avoidance manoeuvres that also involved NASA's Lunar Reconnaissance Orbiter (LRO) and ISRO's Chandrayaan-2.[1] Increased frequency filings from nation states and commercial entities highlight the risk of harmful interference without coordination: the International Telecommunication Union had received more than 50 lunar-spectrum filings from nine States by 12 January 2024, and 2024 was the first year in which commercial filings outnumbered governmental ones.[2] These documented stresses—crowded orbits, narrowly averted collisions, and rapidly rising radio-frequency demand—demonstrate that a neutral, continuously updated clearing-house such as the Lunar Ledger is not optional; it is an immediate safety instrument for every present and future lunar actor.

3. Since 2022, Open Lunar has been researching and developing the Lunar Ledger,[3] which aims to be a neutral, voluntary, and globally accessible platform for sharing information on lunar objects and activities.[4] Designed to complement current and emerging Member State and UN initiatives for lunar information sharing, the Ledger provides a scalable, globally-facing, publicly accessible

[1] Moon-Jin Jeon, "Lessons Learned for Safe and Sustainable Lunar Exploration: The Case of KPLO Operations," technical presentation, Committee on the Peaceful Uses of Outer Space, Vienna, June 20, 2024, UNOOSA, PDF, accessed June 9, 2025, https://www.unoosa.org/documents/pdf/copuos/2024/Technical_Presentations/21AM/2_Item_15_KPLO_Lessons_Learned_Moon-Jin_Jeon_as_of_20_June.pdf.

[2] Center for Strategic and International Studies, *U.S. Leadership in Lunar Spectrum Policy*, CSIS Aerospace Security, March 2025, PDF, accessed June 9, 2025, https://aerospace.csis.org/wp-content/uploads/2025/03/Lunar-Spectrum-Policy.pdf

[3] Open Lunar, "A Global Registry of Lunar Objects and Activities," Open Lunar (project page), published January 1, 2022; accessed June 9, 2025, https://www.openlunar.org/projects/a-global-registry-of-lunar-objects-and-activities

[4] *Lunar Ledger*, accessed June 9, 2025, https://www.lunarledger.space/.

database that facilitates the sharing of technical information among state and non-state actors to enhance lunar coordination. It aims to improve transparency and reduce the risk of mission interference by documenting past, present, and future lunar activities. Built with operators and coordinators in mind, it enables rapid updates from mission actors to reflect the Moon's evolving operational environment.

4. The Lunar Ledger supports voluntary data-sharing across completed, operational, and planned missions, and accepts submissions from governments, space agencies, commercial entities, academic institutions, and civil society. Its design and development are shaped by multi stakeholder input and focused on meeting the practical coordination needs of the expanding lunar community.
5. Since its inception, the Ledger has engaged over 150 stakeholders across six continents, including representatives from national governments, space agencies, commercial operators, and the scientific and academic sectors. Feedback from these engagements has directly informed the platform's design, governance approach, and development roadmap. We very much welcome all opportunities to engage, gather perspectives, and collaborate.
6. The Lunar Ledger is not a substitute for formal legal frameworks and initiatives underway at COPUOS, but rather is a practical infrastructure prototype designed to support the Committee's work and fill a gap for operational data that can be directly uploaded by commercial actors.
7. The Ledger is intended to complement and reinforce existing and emerging relevant state-level and UN-led databases, registries, and information-sharing mechanisms. It will solicit direct submissions from government, scientific, and commercial actors, focusing on information that helps operators coordinate and deconflict. It will also draw from and link to other state, UN, and non-state lunar information sharing efforts, promoting and amplifying their visibility.

II. Project overview

8. The Lunar Ledger is a community-built database that seeks to balance open access with the privacy needs of lunar stakeholders. It aims to support the recording and sharing of essential information about missions, objects, and activities on and around the Moon, particularly information that would support operators to coordinate and deconflict.
9. Its primary goals are to:
    - Improve situational awareness for lunar mission planners.
    - Offer commercial entities access to vital data, ensuring smooth communication and integration of commercial payloads.
    - Reduce the risk of harmful interference.

- Foster voluntary, inclusive information-sharing across spacefaring and emerging space nations, commercial actors, and research organisations to ensure all stakeholders have an accessible and detailed picture of lunar activity.

9. The Ledger is structured to support both:
    - **First-party submissions** (direct from government, commercial, and related operators);
    - **Third-party entries** (submissions flagged as unverified, unless confirmed by the stakeholder themselves, but transparently cited and version-controlled).
    - **Aggregating public information** from relevant sources and linking back to them.
10. Based on feedback from stakeholders, the Lunar Ledger has developed two incentive cases for stakeholders to participate, particularly from the commercial side:
    - **Firstly**, By incorporating a structure that allows for first-party submissions, aggregated data, and voluntary third-party entries, the Lunar Ledger is designed to be resilient against the common "race to the bottom" dynamic seen in many voluntary information-sharing initiatives, where key commercial players may opt out, undermining the system's overall value. The Ledger will feature "unverified" entries submitted by third parties or drawn from public sources, based on the best available information and investigative efforts. Including such entries applies soft community pressure, encouraging mission owners to engage with the platform by 'claiming' and correcting records. This approach helps ensure the Ledger remains comprehensive and credible, even in the absence of universal participation.

      This structure emphasises that "complete" should not be sacrificed for "correct". By ensuring the database maintains a full picture of lunar activities, the Lunar Ledger encourages recurring engagement and supports greater transparency.
    - **Secondly,** transparency through the Lunar Ledger also offers a strategic business and operational purpose. By reducing the opacity of the lunar ecosystem, the Ledger enables mutually arising business and use cases, reducing the friction in forming partnerships and commercial relationships. By transforming the lunar landscape from a "dark forest" into a more collaborative ecosystem, the Lunar Ledger makes clear that openness is good for business. It also serves as a strong demand signal for private investors still sceptical about the long-term viability of investment into firms catering to an unproven cislunar economy.
11. Minimum required fields include:

- Mission name,
- Operator,
- Asset type,
- Contact information,
- Mission location and timeframe
- Activity purpose.
- Optional fields allow for submission of transmission frequencies, orbital parameters, end-of-life plans, scientific payloads, and more.

12. Critically, the Ledger is agnostic to mission purpose or affiliation and is designed to serve all actors: from state missions to private robotic landers, from university science payloads to civil society-led data investigations.

III. Progress to date

13. In 2022 and 2023, the Open Lunar Foundation invested in exploring the need, risks, geopolitics, and policy landscape of lunar information sharing and how an open prototype of a lunar activities and objects database might be built. Further reading- https://www.openlunar.org/projects/a-global-registry-of-lunar-objects-and-activities

14. In 2024, the Open Lunar Foundation conducted a global stakeholder consultation programme focused on the need for and design of lunar information-sharing infrastructure from direct lunar stakeholders.

15. The consultation:

- Reached over 150 stakeholders, with an outreach-to-engagement conversion rate of 85% and a final consultation pool of 49 space agencies and government entities, 33 commercial actors, and 71 representatives of science, academia, and civil society.
- Hosted a dedicated workshop on the sidelines of the 2024 International Astronautical Congress.

16. Key insights from 87 of the 153 stakeholders who agreed to have their input synthesised and anonymously shared included:

- Broad consensus that lunar coordination and information-sharing infrastructure are necessary and need to be developed with urgency.
- Broad consensus that ideally, the primary global mechanism for lunar information sharing should be developed through UNCOPUOS and housed with UNOOSA.
- Broad consensus that the stakeholders would benefit from a complementary database to UN efforts that was technical-focused, operator-centric, quickly updateable, and that directly interfaced with

state and non-state actors (and could facilitate the sharing of contact details between operators on a request-by-request basis) to support better global coordination of lunar activities.

- Emphasis that such a non-UN mechanism should be hosted by an NGO and focus on voluntary participation, global public accessibility, and non-political stewardship.
- Concerns from most stakeholders regarding increasing commercial secrecy and potential geopolitical fragmentation were common, but acknowledgement that increased global information sharing will become essential as lunar traffic increases.

IV. 2025 activities

17. The Ledger enters its Prototype Phase in 2025. Activities this year include:

- Release of Version 1.0 and Version 1.1 of the Ledger by the year's end.
    - Features:
        - Secure, role-based dashboard
        - Granular public/private data controls
        - Mission registry with search & static visualisations
        - Contributor onboarding & data access workflows
        - Audit logs & admin tools
        - Transparent record of all completed and planned missions (through 2026)
- Establishment of a formal Advisory Board with 15+ members across law, science, industry, and space agencies. Our current Advisors can be found here- https://www.lunarledger.space/advisors
- Launch of a Data Buy Pilot to test incentives for data sharing.
- A joint side-event during the UNCOPUOS Informals on the 24th June at 4:15 CEST with the Lunar Policy Platform exploring lunar information sharing, lunar science and ethics, and the Lunar Ledger.
- A public event and Ledger launch at the 2025 International Astronautical Congress in Sydney.
- This year, the Open Lunar Foundation also funded the Lunar Policy Platform's global stakeholder consultations on lunar information sharing.[5] The report from this will be further used to inform the Lunar Ledgers development and complements Open Lunar's own continuing stakeholder outreach.

[5] *Lunar Policy Platform*, accessed June 10, 2025, https://lunarpolicyplatform.org/foundation

- Continuing stakeholder engagement to gather feedback, perspectives, and insight from state and non-state actors on the Lunar Ledger's development.

18. Additional 2025 priorities:

- Finalising the Ledger's technical schema in consultation with first-user missions.
- Aligning metadata fields with existing international registries and UN norms.
- Ensuring compliance with regional and international data protection laws.

V. Building the ledger: fields and verification

19. Based on community feedback, the Ledger is being developed with flexible but interoperable field categories. In its first iteration, these include:

- **Core fields**: mission name, operator, contact details, landing or orbital site, timeframe.
- **Operational fields**: asset type, transmission frequency, operational radius, emergency contact.
- **Optional fields**: telemetry protocols, activity rationales, disposal plans, and data availability.

20. Data submissions are logged with version histories and metadata. A three-tier verification model is used:

- Verified operator-submitted data
- Community-verified third-party data
- Unverified open-source data with attribution

VI. Complementing and Supporting COPUOS and its initiatives.

21. The Lunar Ledger is not a substitute for formal legal frameworks or the initiatives and efforts currently underway at COPUOS and among member states to develop lunar information sharing frameworks and mechanisms. It is instead a practical infrastructure prototype intended to complement the Committee's work by filling a critical gap: providing a channel for operational data to be directly uploaded by commercial actors and state actors in a way that can be quickly updated.

22. The project team is actively engaging COPUOS members and welcomes and seeks Member State guidance, perspectives, and support in continuing to build the Ledger.

23. The Ledger's development can provide for other initiatives:

- An example of how voluntary transparency mechanisms might operate in practice.
- A field test for what works for both state and non-state stakeholders globally in regards to information sharing, and what does not, particularly identifying where there are sensitivities, barriers, or concerns. The information here can be of help to other efforts.
- A technical model to inform information-sharing recommendations.
- A complementary infrastructure that bridges between national, commercial, and scientific data sources.

VII. Conclusion

24. The Lunar Ledger is a developing platform that seeks to support a recognised gap in the current lunar governance landscape.

25. It is being developed in a modular, phased, and stakeholder-informed way, designed to build confidence, support international cooperation, and reduce operational risks in the lunar environment.

26. Open Lunar welcomes expressions of interest from Member States, Observers, and industry stakeholders. We are especially eager to collaborate with actors pursuing transparency, data interoperability, and peaceful lunar development.

27. We look forward to supporting the Committee's work and remain available to provide technical briefings, data schema documentation, and policy consultations upon request.

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