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BRIEF STATEMENT ON THE LEGAL REGIME FOR SPACE ELEVATORS

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Arthur C. Clarke's book "The Fountains of Paradise" focuses on possible use of an elevator for access to outer space. Space elevator technology did not exist when Clarke's book appeared in 1978. But in 1992 carbon nanotube (CNT) technology was discovered. CNT fibres can be used to build a virtually unbreakable string that could be used to guide an elevator platform into outer space up to Geostationary Orbit (GSO) or even beyond GSO. The platform itself would be independently propelled by lasers or power beaming. The platform would be used to carry materials and people into outer space.¹ NASA sponsors an annual competition in order to promote space elevator technology.² The greatest advantage of space elevators would be significantly lower cost launches. Space elevator launches could cost as little as \$400 per kilogram as compared with the current \$20,000 per kilogram. Furthermore the technology is 'green.'

Space elevators need legal protection. The applicable legal regime is largely in existence now. It is a combination of international law and national law. International space law applies in non-sovereign outer space and domestic law applies in sovereign space. The following is a thumbnail sketch of the applicable legal regime.

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A. INTERNATIONAL LAW

Legal significance attaches when the space elevator is in outer space. The 1967 Outer Space Treaty³ (OST) governs activities by states in outer space, but where does outer space begin? Outer space is not clearly defined by international law. OST, Art. IV, states that the Outer Space Treaty applies when an object is 'in orbit,' which may happen at about the 100 kilometer altitude. (Australia has by domestic law defined space above 100 km altitude to be in outer space. The USA declines to identify and designate an exact delimitation but recognizes that the OST applies in outer space.) In summary, the Outer Space Treaty governs the space elevator and its activities in outer space.

The OST would permit the space elevator free access to outer space. However, OST, Art. VI,⁴ requires States to authorize and supervise all national activities in outer space: that includes licensing and continuing oversight of space elevators. OST, Art VII, makes states liable for damages caused by their launches into outer space. Under Art. VIII, the law of the national state applies to objects launched into outer space. That means that national laws govern property rights to any space elevator launched by a national state and to its loads. OST, Art. IX, requires national environmental

oversight. States shall avoid environmentally harmful activities and shall pay "due regard" to the interests of other States.⁵

Space elevators and their CNT ribbons may be impacted by debris. Fragments of the space elevator system may either become space debris or may enter the Earth's environment. If the pieces of the elevator and the CNT are of "hazardous or deleterious" nature then the Aid to Astronauts Conventions, Art 5,⁶ requires the launching state to eliminate harmful consequences and to pay for their removal if so requested by the launching state.

The Liability Convention⁷ further elaborates on liability of the launching states for space elevators. The Convention clarifies that states are liable for damages caused by the space elevator, and for the material or people being launched. Regarding damage on the Earth, the launching state is absolutely liable for surface damage and for damage caused to aircraft in flight. Regarding damage in outer space, the launching state is liable for damage caused in outer space to the space objects and to personnel of space objects of other states; but the damaged state must prove that the damage was caused by the fault of the launching party. Finally the Registration Convention⁸ requires the launching state to register space objects, such as space elevators and its materials, in a national register, as well as in an international register maintained by the United Nations.

The space elevator is also governed by the UN Charter and existing international laws.⁹

B. NATIONAL LAWS

The national states are compelled to insure that the space elevator and their operators launching in their states comply with the provisions of the space law treaties. OST, Art VI, requires the space elevator operators to obtain authorization from the launching state which must continuously supervise the space elevator activities.¹⁰

Many states such as India and China probably will make the space elevators directly subject to the space law treaties without further implementing legislation. Other states, such as the USA and Australia have adopted domestic laws to regulate private commercial space activities, including space elevators. These laws will be specifically extended to cover space elevator operators as soon as it appears likely that space elevators are going to be built. In the USA the space elevators and the operators will then become subject to the five step Federal Aviation Administration (FAA) licensing process established in the US Commercial Space Launch Act:

- (1) Pre-application consultations;
- (2) Policy review of the technology and the applicant's ability to comply with national security regulations;
- (3) Safety review of the operator's entire organization;
- (4) Payload examination; and
- (5) Environmental review.¹¹

Several states, including the US, will assume liability for catastrophic losses in excess of \$500 mill. Or the level of maximum insurability for launches authorized by the government.¹²

C. CONCLUSION

A main business concern of the operator of the space elevator will be with liability exposure and possible debris damage because one major accident could ruin the business enterprise. The operator is therefore well advised to seek the protection of the national state while building the space elevator in non-sovereign territory where many other states may interfere with the building and operation of the space elevator. It will be in the business interest of space elevator operators to obtain government authorization. It will also be in the interest of national states to supervise and regulate their space elevators in order to avoid breaches of their international treaty obligations.

ENDNOTES

¹ Bradley Edwards, *The Space Elevator*.

² Gomes, *The Final Frontier: Just a Ride Away on a Space Elevator*, *Wall Street Journal*, Aug. 22, 2007.

³ *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 610 UNTS 205 (1967). Lyall and Larsen, *Space Law: A treatise*, Chapter 3, Ashgate (2009).

⁴ *Id.*

⁵ See Larsen, *Application of the Precautionary Principle to the Moon*, 71 *J. Air L. & Com.* 295 (2006)

⁶ *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 672 UNTS 119 (1968), and UNGA Resolution 62/217 approving voluntary guidelines on space debris mitigation. For further discussion of outer space debris see Lyall and Larsen, *supra* n. 3 at 301.

⁷ *Convention on International Liability for Damage Caused by Space Objects*, 963 UNTS 187 (1972).

⁸ *Convention on Registration of Objects Launched into Outer Space*, 1923 UNTS 15 (1976)

⁹ *Outer Space Treaty*, Art III, *supra* n. 3.

¹⁰ *Id.*

¹¹ For U.S regulation see 49 U.S.C. 70103. Limitation of liability is provided in 49 U.S.C. 70112. For other national regulation see Lyall and Larsen, *Space Law, A Treatise*, Chapter 15 *supra* n. 3

¹² *Id.*