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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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MEDIUM EARTH-ORBIT TETHER EXTENDING OUR REACH

Abstract

Space elevators have the potential to revolutionize human activities in space and make space truly accessible to all. Numerous papers have extolled the benefits such systems could provide to people across the world. However, numerous technical policy, and economic challenges have prevented this from becoming reality. Smaller space tether projects have shown some potential for propulsion and debris removal applications, but have lost the grand vision of the original space elevator and large space tether concepts.

The development of a low Earth orbit to medium Earth orbit tether system has the potential to recapture this vision. Such a system would demonstrate real progress towards the development of a space elevator and have many useful applications. Over time, this tether system could be expanded and improved incrementally, forming the basis of a larger tether stretching to geostationary orbit. Eventually, it could evolve into the basis of a true space elevator.

The opportunity presented by this incremental approach can be expanded further by reusing assets and material already in space as part of the initial tether system. The International Space Station, which under current plans will be decommissioned by 2028, could represent an ideal opportunity for such reuse. This would serve as an ideal first demonstration of a large space tether system; by virtue of its large mass, broad public support, capacity for human occupation, and clear applications, the use of the ISS inherently relieves many of the obstacles that have faced tether projects generally. If well designed and successfully demonstrated, such a system could represent both a physical element of a future larger system and an important driver of public support for future development of large tethers and space elevators.

This paper will outline the case for the development of a LEO to MEO tether system that will reuse

the international space station and the potential for such a system to evolve incrementally over time into something truly transformative. The paper will then briefly outline some challenges that must be overcome for this concept to be realized and offer recommendations for how this might occur.