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APPROACHES TO TAMING OSCILLATIONS OF TERRESTRIAL SPACE ELEVATORS AND REDUCING THEIR EXPOSURE TO VAN ALLEN RADIATION.

Abstract

We will propose and then explore the parameter space of solutions to several problems that threaten feasibility of the terrestrial space elevator concept. Current design concepts for Earth-based space elevators employ a climbable ribbon made using carbon nanotubes, have a deployed length of approximately 100,000 km, a mass of roughly 1 million kg, and a space-end counterweight of approximately 800,000 kg. The recent multi-year study, "Space Elevators: An Assessment of the Technological Feasibility and Way Forward," published by the International Academy of Astronautics (IAA), concludes that such terrestrial space elevators "seem feasible." Nonetheless, several problems remain which threaten that feasibility. We have previously touched on two categories of these: oscillations induced by various kinds of outside forces, and extreme radiation hazards encountered while traveling along segments of the elevator that traverse the van Allen belts. More specifically, we have explored oscillations induced by solar radiation pressure, and those arising from electromagnetic interactions with the local space environment. We have also warned that the van Allen radiation environment is so intense that conventional shielding required to protect humans within a capsule climbing the space elevator would be prohibitively massive. In this conference presentation we will revisit both oscillation and radiation hazard problems. Energy dissipation and diversion is the common element that unifies the problems to be discussed and some novel as well as obvious possible solutions will be explored.