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A MID-EARTH ORBITING TETHER FOR NUCLEAR WASTE DISPOSAL

Abstract

A mid-Earth Orbiting tether is proposed as a mechanism to both reduce costs of space access and simultaneously increase the safety of launch of highly radioactive nuclear wastes. The International Astronautical Academy has a cosmic study investigating the feasibility and utility of space disposal of nuclear wastes. Historic studies have shown that for most extra-terrestrial orbits, the likelihood of accidental return to Earth is 1 part in 10⁸ over a 10,000 year time frame. For a payload soft-landed on the Moon, the likelihood of accidental return once on the surface of the Moon is almost incalculably small. This is a very low probability and given the shielding of a nuclear waste capsule, even a remote reentry would pose little risk. Experts have generally conceded that space disposal is a viable solution, if it can be shown that the launch system is sufficiently reliable to effectively eliminate catastrophic launch failures. It seems as though only some form of fully reusable vehicle will fulfill such reliabilities. Present aircraft major accidents are approaching one major accident in 10⁷ takeoffs and landings. A fully reusable orbital vehicle will have an extremely difficult time achieving these objectives, indeed

A mid-earth orbiting tether has the capability of reducing the ΔV to reach the tether versus orbital velocity by 3-4 km/s. This enables two important factors. First, it is not necessary to have a LOX-LH2 main engine technology, LOX-Kerosene has sufficient specific impulse to perform the job. It is also denser and a soft cryogen. Second, the reentry thermal loads are a fraction of the thermal loads compared to an orbital reentry. The IAA study is considering space elevators, the Mid-Earth orbiting tether could be available much sooner with much lower risk and cost. Ultimately, space disposal needs to be economically feasible with known and understood revenue streams. This paper addresses the technical and economic impact of a MEO tether toward space nuclear waste disposal.