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Space Elevators and Tethers (4)

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# SPACE ELEVATOR STAGE I

**Abstract**

One of the challenges of building the space elevator is to deal with the effects of Earth's turbulent atmosphere without adding substantially to the weight that has to be supported by the rest of the structure. A solution is to use the space cable, which is a development of the launch loop (or Lofstrom Loop). The launch loop is capable of propeling a vehicle into orbit electromagnetically, but the technology can be adapted to act as a high-altitude support structure. A version 100 km high can be built with an interchange at the top for transfer, either to the main space-elevator ribbon or to a second-stage tether. The lowest 100 km is proposed as the space elevator stage I. The space elevator stage I stands on the ground or on a marine platform. It is held aloft by fast-moving projectiles called bolts traveling inside evacuated tubes. To minimize friction and energy consumption, they use magnetic levitation with permanent magnets stabilized with electromagnets. Whereas most earlier versions required two surface stations as far apart as the structure's height, the space elevator stage I has a single surface station on the ground or at sea. This is achieved by means of cross bracing between the heights of 50 to 70 km that draws the tubes together, with the bolts traveling inside them, so that they converge at the Earth's surface. To maintain stability in the presence of gusting cross winds, a technique called active curvature control transmits the forces to the surface station. The support structures at the surface station are designed to accommodate the consequent movement of about 180 metres in any horizontal direction. Previous work has shown that similar structures are feasible using Kevlar as the main load-bearing material and Neodymium Iron Boron (NIB) in the magnets. Because these materials are available today, the space elevator stage I can be built now and so provide valuable experience of reaching space using a fixed infrastructure. Hence it can be stage I chronologically as well as the lowest stage physically.