SYMPOSIUM ON VISIONS AND STRATEGIES FOR FAR FUTURES (D4)
Access to Space in the Far Future (3)

Author: Dr. John Knapman
United Kingdom

DIVERSE CONFIGURATIONS OF THE SPACE CABLE

Abstract

The space cable consists of several pairs of evacuated tubes a few centimetres in diameter; they stand on the ground or at sea. Inside the tubes are fast-moving projectiles, called *bolts*, that support them using magnetic levitation. Configurations suitable for launching vehicles to space reach altitudes up to 140 km. They are also suitable for astronomy, communications and tourism. The space cable is a variation of the launch loop (or Lofstrom loop), which is itself a variation of the space elevator.

One advantage of the space cable is that it can be built in various configurations and sizes, and two versions were described in previous IAC technical sessions. There is an upper height limit due to the tension in the tubes, but the length over the ground can vary. A length of 1050 km is sufficient to launch a manned vehicle directly to orbit with g-forces no greater than $6g$. With shorter versions, the launched vehicle may need to use some of its own propulsion for the final stage to orbit. In that case, the space cable replaces the large fuel-intensive lower stages of a rocket.

It is possible to build versions of the space cable just a few metres high. This is important by analogy with other technological developments such as rockets, boats and aircraft. They all started small. People were then able to scale them up to the sizes we see today. Starting small seems to be a key requirement for long-term success.

One promising application is generating electrical power from wind. As shown in previous publications, the space cable can be effectively stabilized in strong winds. An adaptation of this work can be applied to wind power with the advantage that winds are much stronger and more reliable at high altitudes than low ones. Hence, scaling up brings a double advantage: both the usual economies of scale plus the benefit of more wind. The turbines and cables need to be coaxial, which is different from the familiar horizontal-axis designs, but coaxial turbines can be adapted from existing vertical-axis turbines that are already available commercially.

All the configurations mentioned here can be built with known materials that are commercially available. The technologies used are moderate extensions of what is working today. The exploration of small-scale applications brings us closer to realizing the objective of low-cost, low-energy access to space for humanity.