

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

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FROM THE EARTH TO THE MOON BY GONDOLA

Abstract

The access to (and return from) space is unchanged since the beginning of the space age. Launchers and capsule reentry using aero braking are yet the only answers, even if their performances in terms of ratio of the useful mass with respect to the initial mass are very poor while their impact on the environment is far from negligible.

The expected maturity of Carbon Nanotubes technologies will allow to manufacture unlimited length of thread through a continuous fabrication process and thus change drastically the access and return from space paradigm by opening the way to the exploitation of a permanent link between two terminals, one located at the Earth South pole and the other somewhere on the visible face of the Moon.

A bundle of cables would connect these two terminals and enable the transportation of passengers and cargo between them, with possible intermediate platforms in some noticeable locations such as the Lagrangian L1 point of the Earth-Moon system, the Earth geostationary orbit area or some gravitational analogs of Mars or the Moon, closer to the Earth.

As a consequence of the orbital characteristics of the Moon with respect to the Earth, some major concerns have to be solved: the rotation of the Moon around the Earth, the variation of its elevation and the variation of the Earth-Moon distance.

The first part will present a preliminary sequence of the cable installation in 5 steps:

- From the L1 area of the Earth-Moon system first to the Moon, then to the vicinity of the Earth making a stable configuration on about 300,000 kilometers in length
- Then an extension to an altitude of 40,000 km ending by a GEO+ station
- Starting from the South pole of the Earth, a set of stratospheric balloons and flying wings is deployed over a range of 3,000 km from the South Pole
- The last task to achieve for completing the gondola infrastructure is to connect the GEO+ station to the Airborne Polar Station.

The second part of the presentation will be dedicated to a short list of feasibility studies that have been kicked off at ENSTA (Ecole Nationale Supérieure des Techniques Avancées) and cover different topics such as space debris resilience, natural stability of the tether, implementation scenarios, intermediate stations...