

17th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Space Elevator Critical Technology Verification and Validation Testing (3)

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PROGRESS REPORT ON THE MULTI-STAGE SPACE ELEVATOR

Abstract

The multi-stage space elevator is a technique for reducing the strength requirement of the material for a space-elevator tether. The method is to support the lower part of the tether by means of objects called bolts that travel in a continuous stream from the earth's surface to two or more upper stages and then return to Earth. The rate of change of momentum at the upper stages creates enough force to support the weight of the tether and climbers below each stage.

Work is going on to develop this idea by building and testing critical components and design points. The bolts are deflected by semi-circular structures called ambits. At the earth's surface is the lower ambit that turns the descending bolts around and sends them back up using magnetic levitation in a vacuum. Electromagnetic thrusters boost the bolts' velocity to make up for any residual losses. They also accelerate them during initial construction.

Prototypes of the thrusters and magnetic levitation components have been tested in air. The work under way now is to test the magnetic levitation and thrusters in a vacuum chamber in order to gain better knowledge of their efficiency and to assess and measure the remaining losses. This will enable further work to improve their efficiency. Thereafter, we will assemble these components into a small-scale version of the lower ambit and first-stage ambit, which together will form a complete circle.