

# Applications of Tethers in Space, Volume 1, #1985 #NASA, STIB, 1985

A space tether is a conducting cable attached to a spacecraft that can be used for a variety of purposes such as supplying power to the spacecraft, raising or lowering its orbit, or transferring payload from Earth to high altitude orbits at a significantly lower cost than with conventional methods. This project examines several different types of space tethers with the object of trying to identify the ones with the greatest promise for future applications. This IQP, which analyzes the functionality, construction, limitations, and applications of space tethers, is part of a larger group of space policy IQPs that are being conducted during the 2006-2007 academic year. This project is an outgrowth of an earlier IQP on the Space Elevator, which may be regarded as an extreme kind of space tether. A new edition of the Tethers in Space Handbook was needed after the last edition published in 1989. Tether-related activities have been quite busy in the 90's. We have had the flights of TSSI and TSSI-R, SEDS-1 and -2, PMG, TIPS and OEDIPUS. We are just stepping out of the pioneering stage to start to use tethers for space science and technological applications. As we are writing this handbook TiPs, a NRL tether project is flying above our heads. There is no emphasis in affirming that as of today spaceborne tethers are a reality and their potential is far from being fully appreciated. Consequently, a large amount of new information had to be incorporated into this new edition. The general structure of the handbook has been left mostly unchanged. Space tethers are long cables which can be used for propulsion, momentum exchange, stabilization and attitude control, or maintaining the relative positions of the components of a large dispersed satellite/spacecraft sensor system. Depending on the mission objectives and altitude, spaceflight using this form of spacecraft propulsion is theorized to be significantly less expensive than spaceflight using rocket engines. In space, tethers have similar uses. For instance, they can be used to connect spacecraft to other satellites, space stations, or even asteroids. An advanced tether system, called a "space elevator," may even link Earth's surface directly to orbit, so you could climb all the way into space. Space tethers also could be used to swing spacecraft from one orbit to another, or even from planet to planet, without using rocket propellant. If electricity has to flow through them, conducting wires are also incorporated. There are many types and applications of tether systems; as we will see, the possibilities for this novel technology are amazing. In this chapter the main types of space tethers are introduced, as a basis for the more detailed descriptions of concepts and missions in later chapters.