

LOW COST STATION KEEPING MANEUVERS FOR A SMALL-SATELLITES
CONSTELLATION IN TUNDRA ORBITS

A. Cramarossa¹
G. Rondinelli¹
F. Graziani²

ABSTRACT

A constellation of three small satellites placed, in highly inclined geosynchronous eccentric orbits equally spaced, can provide a continuous coverage of a service zone at high latitudes.

Satellites on such orbits (TUNDRA) will spend most of the time around the apogee and each satellite of the constellation is required to be at a certain position in the orbit at a fixed time interval, in order to keep the constellation synchronism, which is requested by the user's antenna to have at switch-over time an isopower signal.

To counteract the orbit perturbations (mainly due to lunisolar effects), that do not preserve the subtract longitude and synchronism, a low cost maneuvers strategy is proposed.

These maneuvers are designed to control both the principal requirements (longitude and synchronism) by adjusting only the semimajor axis (in-plane maneuvers). Since perigee burns are more economical than apogee burns only the apogee radius is adjusted. The evolution of the orbit parameters with a typical sequence of maneuvers is examined including the effects of the moon, sun and a reduced (forth-order) Earth potential model. The effects of the atmospheric drag have not been taken into account due to the high perigee altitude.

The maneuvers strategy proposed seems to be very promising in terms of delta-V.

This result could yield a favorable opportunity in the use of small satellites for long duration missions (e.g. 5-7 years).

¹Italspazio, Roma, Italy

²Sculoa di Ingegneria Aerospaziale - Universita' "La Sapienza", Roma, Italy