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COMPLEX MODELLING AND TESTING OF GLOBAL TELECOMMUNICATION HARDWARE

Abstract

Creating a global telecommunication satellite network poses many challenges. Though we know that some systems of that kind have already been created, they are but pioneers, their service lacking the quality and affordability it takes to make them truly global. The next step in this direction lies in simplifying the concepts and developing a complex strategy for modelling and testing, so that every major hypothesis is confirmed or abandoned long before the construction of the first satellite begins. As Yaliny pursues its ultimate goal – to create and launch a global mobile telecommunication network, several challenges have already risen and been met, resulting in abrupt changes in satellite design, constellation parameters and company's whole business plan. This work presents the results of a year's work in Yaliny, the decisions made and the plans of the company about its satellite constellation development. First, the work provides the description of the station-keeping problem and the solution developed. Since a global telecommunication network is a complex structure, it is not enough just to compensate for the atmospheric drag, keeping the satellite's altitude more or less stable. The strategy must also include ways to deal with other orbital elements' secular drifts and other changes dislodging the satellites from their operating points and making the communication impossible. It also tells about how it is planned to deliver big clusters of satellites into several orbital planes from a single point after launch. All the modelling was made using the company's own software. Second, the work describes one of the experiments the company is intending to carry out to test the onboard hardware. While testing the telecommunication system down on the ground is of course necessary, the only way to perfectly model the relative positions, velocities, and other parameters of the link budget is to launch the hardware into space, which is far more expensive. Sort of a solution in this situation might be to put the experiment head over heels, and keep the most crucial part, the hybrid active phased array antennae, on the ground where it can be readjusted and easily maintained any time, whereas the subscriber terminals intended for ground use will be launched into space. Their mass and size allow to perform all the tests on CubeSats, making the experiment significantly cheaper. The work provides calculations and expected results for this kind of experiment, which we are planning to conduct in early 2017.