

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Upper Stages, Space Transfer, Entry and Landing Systems (3)

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THE ADAPTIVE ALGORITHM OF SEPARATION PROGRAM FOR A NANOSATELLITES
CLUSTER FROM SPACE PLATFORM EXECUTED UNCONTROLLED MOTION**Abstract**

Now there is a tendency in the world of increasing a nanosatellites launches number in comparison to the total number of orbiting spacecraft. At the same time, the range of tasks solving by clusters of nanosatellites is expanded. Usually for this kind of satellites it is used a piggyback launch with a space platform, for example, the orbital stages of rockets. Process of separating nanosatellites is one of the most critical stages of their operation. Emergency processes of the separation or a wrong choice of separation program's parameters leads to the failure of mission objectives. It can lead to dangerous approaches of nanosatellites to each other or to a space platform. The aim of this work is to develop an adaptive algorithm for choosing of separation parameters for a nanosatellites group. Algorithm should allow us to recalculate the separation program quickly in case of an emergency (for example, failure of an attitude control system) on a space platform. The algorithm is based on the use of probabilistic analytical models of the relative motion and uses a priori information about the possible range of angular velocities that can obtain a space platform in case of failure of the attitude control system. The algorithm allows to determine the areas of values of time delay and separation velocity for each nanosatellite using the requirements of safety relatively to the space platform and the minimum time delay between the separation of nanosatellites to provide a safe relative motion and distance no more than required. To select separation parameters nanosatellites from the found areas it is proposed to use a minimax criterion of a distance between them. The algorithm consists two stages. At the first stage after determining a set of nanosatellites separation parameters that have satisfied all the necessary conditions it should be determine the maximum distance between the nanosatellites. At the second stage it should be selected those separation parameters for which the maximum value of the distance between the nanosatellites are minimal. The developed algorithm of selection separation program for a group of nanosatellites separated from an undirected space platform is based on the use of analytical models and provides guaranteed separation parameters for safety in case of emergency. The algorithm can be implemented on board of a spacecraft platform.