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SYSTEM ANALYSIS OF SPACE INDUSTRY PROJECTS AND ORBITAL COMPLEX DYNAMICS AND CONTROL

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This paper analyzes the scientific results obtained at the Department of System Analysis and Control Problems of the Institute of Technical Mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine. When the department was established, its lines of investigation were defined as follows: the study of free and controlled modes of operation of spatially developed transformable ground and space mechanical systems under a broad gamut of input actions and system analysis of space industry problems. For the past five years, investigations have been conducted along several lines: launch vehicle design parameter optimization, spacecraft and space complex dynamics, tethered space systems, large-size transformable space structures, space manipulator dynamics, orbital service system ballistics, the space debris problem, system analysis of space industry problems – the development of cognitive analysis technologies, and molecular gas dynamics problems.

With account for the features of the state of the art in the development of space technologies and the corresponding lines of investigation, trends in the formation of the space technology physiognomy were revealed: (i) component miniaturization and the development of small-size spacecraft platforms based thereon and (ii) the widening of the scope of engineering problems involving the industrial development of near-Earth space using large-size space structures.

These trends in the development of space technologies determine new and modified scientific lines of space investigations. In this context, the following lines of further investigations are now being formed at the department: the development of a new space debris mitigation concept based on the use of space debris as a resource for industrial production at orbital complexes, the development of new approaches to extending the active life of spacecraft based on space servicing technologies with the use of models and methods of risk assessment and information security, the elaboration of basic principles for the development of platforms for industrial production in near-Earth space carrying a power, a production, and a service module, and further development of control principles and technologies for large space structures and spacecraft groupings.

Keywords: *system analysis, cognitive models, spacecraft dynamics, mathematical models, structural and parametric identification, space debris, tethered systems, controllable rocket objects, launch vehicles, solar space power stations, orbital servicing, probe particle method, vacuum aerodynamic apparatus.*

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