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## SPACE PROJECT «PENTA» COMPLEX

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«PENTA» project is devoted to creation of a complex workplace onboard the ISS, and is intended for realization of long-time on-board research experiments in the field of space materials science, space biology, and heat-mass transfer under the conditions of microgravity and influence of the factors of space flight.

«PENTA» experimental flight complex provides five independent experimental cells working in a consecutive-parallel mode. Three of them are intended for realization of the comparative study of the following tasks:

- processes of friction and wear of functional materials;
- characteristics of resistance to fatigue failure of various classes of structural and functional materials for space applications;
- optical and physical properties of thermo-regulating and protecting coatings, elements of solar batteries and on-board optical systems under the conditions of the actual space flight and ground-based laboratory simulation.

The fourth cell is intended for realization of space experiments on liquid helium boiling with artificially created variable relative level of microgravity (*HERUBIM experiment, chapter II.6, editor's remark*). And, finally, in the fifth cell the realization of long-time space experiments to study the influence of magnetic fields and microgravity on the dynamics of growth of vegetative objects is planned (*«Penta-Plant» experiment, chapter II.4, editor's remark*). The details of the proposed experiments are described in the subsequent articles.

Despite a variety of the tasks addressed by the «PENTA» complex, it is proposed to organize one flight work place for carrying out these experi-

ments, as all the experiments imply quantitative control of the space factors and simultaneous measurements of physical characteristics of the objects under study. It will allow unification of complex blocks, which are carrying out common functions for all experimental cells. Such blocks include the power supply block, control instrumentation block (temperature, vacuum, radiation factors etc.), block of data accumulation and processing, control block, block of the interface with the on-board computer, platform for exposed samples in raw space, system of photo- and tele-visualization of objects etc.

Such a principle of construction of «PENTA» workplace combining a unified common power, measuring, information, and structural infrastructure with replaceable experimental cells, allows the equipment weight and overall dimensions to be reduced and the expensive flight time of the ISS to be used in the optimal manner.

Among others, the results obtained during scientific space experiments in «PENTA» research complex, will be used to solve the following tasks:

- ensuring long-term, reliable and safe operation of separate units and systems of space vehicles;
- improvement of the validity of calculation of the processes in two-phase «gas (vapour) — liquid» space systems of cooling and fuel systems under microgravity conditions;
- production of new structural and functional materials with a high efficiency;
- development of the methods for compensation of the negative influence of gravity force absence on biological objects and creation of biological systems of life-support of the crew during long-term space flights.