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Aerospace education program realization by means of the micro-satellite

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Abstract

The aerospace education is the basic task of the Program (PSEMS' 2002–2007) of the Scientific-Educational Micro-Satellite (SEMS) pursues solely humane objectives associated with directional evolution of interests of the students and extension of knowledge in a selected area through a wide use of practically received space information, the use of space and computer technologies. The main objective of the PSEMS is to introduce a new, highly efficient method of education for schoolchildren and students based on the development, launch of satellites and their use through school centre of reception of the telemetery information (SCRI), data receiving, processing and physical interpretation. Cosmonautics as a field of science and technology is a unique area of research and educational activity where interests of all branches of scientific knowledge cross. The PSEMS solves the tasks in three directions—educational, scientific, technical—and is based on sequential evolution of tasks—from a simple to a more complex one. The PSEMS is not commercial: it does not pursue deriving a profit. Money received from the PSEMS implementation will be invested to projects of new satellites, new research programs and development of logistics based on organizations involved in the activities.

1. Introduction

Orientation of the PSEMS is the development and use of micro-satellites (MS) in the interests of science and education—"Space to Youth, Youth to Space" is unique in world practice [1]. Solution of scientific, technical and educational tasks of the PSEMS makes

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possible the development of a long-term space educational system for youth, based on interactive cognition of the most comprehensive component of environmental activity—space.

New generations can be taught to think on a global, space-wide scale, not confining oneself to a circle of narrow tasks. Such complex field of activity as space research and development gives such a possibility and allows one to find application to inclinations and interests of any one being taught, making them more profound and extended. Space exploration allows one to bring together the diversity of knowledge from different fields, both the humanities and engineering.

Introduction of virtual aids to the modern education process, when actual processes are modeled on computers, narrows the picture of perception of the environment—the picture on the monitor will never replace a lively contact with nature, the actual physical processes. A learner prefers to touch what he studies. Therefore, the need for use of visual aids and laboratory experiments in the educational process is not driven away and is as useful as before. A SEMS in combination with the SCRI becomes just the modern visual aids: operational, versatile, popular, global ones that make the process of getting knowledge more profitable and substantially efficient as a whole.

This program has been worked out by leading scientists and specialists of organizations and institutions of the rocket and space technology and is designed for development on the lines of scientific research and educational activity on an essentially new basis—the use of micro-satellites as a peculiar kind of visual aids. The program originated in the Russian–Australian initiative on development and launch of micro-satellite "Kolibri-2000". Within a short time, it has been possible to organize joint operation of students at different continents, that confirmed the feasibility to use the program by essentially any inhabitant of our planet.

Micro-satellites (satellites of no more than 100 kg in mass) are attractive for education purposes, first of all due to the fact that owing to small mass and dimensions they can be delivered to an orbit as a "pickup" cargo and, hence, do not require complex procedures of launch processing and high expenditures. Besides, a small satellite requires less production and test areas and can be developed by small teams on a short notice.

2. Main principles of the PSEMS

2.1. Openness

- The program is open for state, public organizations and private persons.
- The use of radio-amateur communication channels and Internet opens wide possibilities and easy access of the students to the program.

2.2. Thoroughness

- The program sets real and urgent humane and scientific and technical tasks that are important for development of modern sciences about man, Earth and Universe.
- A wide coverage of the students by the program activities is combined with a serious approach to space exploration and adaptation of scientific and technical methods to the educational process and the use of achievements of space and computer technologies in the interests of space education.

2.3. Accessibility

- The methodology of the program projects development pays special attention to preparation of education questions with regard to base knowledge of the students allowing, if necessary, extended study of selected subjects and observance of the principle "from a simple to a complex one" with sequential and stepwise buildup of the knowledge scope.

3. "Kolibri-1"—the PSEMS base project

The launch of the Russian–Australian SEMS "Kolibri-2000" ("Kolibri-1") on November 26, 2001 became the first PSEMS project [2]. The SEMS was delivered to the International Space Station by the