Pic. Development of pea plants against the background of heavy metals:
1 – non-treated with SA; 2 – treated with SA.

The studied plants varied in their ability to accumulate heavy metals. At the pre-treatment with SA the toxic metals accumulation in the quantities not exceeding the MCL (maximum concentration limit) was registered in the tissues. At that nickel was accumulated in the maximal concentrations, and cadmium – in the minimal ones. In the nutrient solution with a high concentration of HM the non-treated plants accumulated the metals in the concentrations considerably exceeding the MCL. The data of the table show that the lead content in this variant exceeded the norm 1,7 times, and nickel – 4,1 times. As the results of visual observations testify, a high HM concentration in the nutrient mixture without the plants' pre-stimulation with super-low SA dosages leads to the inhibition of growth processes (pic.).

According to the analysis results the plants grow better and accumulate a less amount of HM when using super-low dosages of endogenous stimulants of nonspecific resistance, which salicylic acid is referred to. This method allows obtaining the environmentally sound forage crop at a high technogenous load.

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Shot report

USE PERSPECTIVES OF MULTIFUNCTIONAL SPACE SYSTEM OF RUSSIAN-BELARUSIAN FEDERAL STATE FOR HUMAN PURPOSE

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The article is devoted to the possibilities of perspective multifunctional space system of the federal state of Russia and Belarus to the benefit of maintenance support of Russian and Belarusian specialists' education, training and retraining process. Both general problems connected with the Federal State multifunctional space system creation and the problems of its application for human purposes, in the interest of Russian and Belarusian citizens' training using a distant mode of study in particular, have been considered in the article.

In the modern stage of the Federal State development an effective economic cohesion of Belarus and Russia is impossible without the creation of an integrated information and educational space affording an opportunity to get and apply the data throughout the whole collaboration spectrum operatively. Taking into account the current level of the space systems and technologies development one can legally speak nowadays on the paramount role, which the space-

system engineering is called to play in the formation of such space.

For the Federal State the application of space means is of singular value. The specific character of its geographical position, resources and socio-economic objects' allocation is such that the majority of socio-economic programs cannot be successfully implemented without using the results of space activities. The space collaboration of the two countries goes beyond the scope of carrying out joint research. The agreements on integration and joint use of space means by Russia and Belarus in such directions as rational use of nature, navigation and telecommunication development, carrying out the earth surface ecological monitoring, effective use of transport and hydrometeorologic forecasting enhancement, teaching, training and retraining of personnel.

The creation of a multifunctional space system of the Federal State will promote the integration processes' speed-up in the Federal State in the field of space activities to the benefit of an integrated information and educational space creation, the efficiency upgrading of spin-off benefits from space research in socio-economic, ecological and humanitarian spheres.

The main problems being solved while creating the multifunctional space system of the Federal State are:

- the introduction of science intensive space technologies into different science, engineering and economics realms inside of the confederacy of Belarus and Russia, their joint market promotion of space technologies and services;
- the creation of stable cooperation of rocket-and-space branch organizations of Belarus and Russia on the development of perspective space means and technologies including micro- and nanotechnologies;
- the development of organization basis and regulatory framework for the Federal State's multifunctional space system effective use to the benefit of the Federal State's regulatory body information support;
- the Information Analysis Centers structures creation to the benefit of the Federal State's regulatory body decision making provision in daily activities and in conditions of emergency situations on the ground of complex monitoring information use;
- the Federal State's consumers' provision with navigational data got by the space navigational systems on behalf of solution of wide range of socio-economic problems, the freight traffic activity efficiency upgrading and high precision positioning among them;
- training and retraining of the Federal State's specialists in various realms of science and engineering, in the field of space activities using distant mode of study as well;
- the international cooperation with the Third Countries in the field of creation and joint use of the Federal State's multifunctional space system.

The main application areas of the Federal State's multifunctional system are:

- the provision of Belarusian and Russian consumers with monitoring information;
- the provision of high precision positioning of static and mobile objects, mobile facilities monitoring and control in the Federal State's territory and abroad;
- the enhancement of possibilities to get education by the citizens of Belarus and Russia living far from large education centers.

In general the multifunctional space system of the Federal State represents a complex managerial and engineering structure including the existing and being created (based on new generation micro-satellites) orbital technologies and also a special earth based complex including:

- the system of consumers' provision with monitoring information;
- the interstate navigational information system;
- the distance education system.

It should be noted that the maintenance logistics problems of the educational process using modern telecommunication technologies, the space one among them, in the Federal State's multifunctional space system are given special priority. It is associated, first of all, with the fact that education is the base for any economy branch development in any country, and modern space technologies open manifold possibilities for getting necessary knowledge even in the most hard-to-reach and remote from education centers aggregations.

When speaking of the Federal State, the steady growth of joint scientific and technical programs and projects increases the demand for highly qualified young specialists and scientists. However, the practice testifies to a difficult enough personnel situation in scientific organizations and on the industrial shop floors of Russia and Belarus, which is conditioned by the lack of proper inflow of newcomers and, as a consequence, personnel "aging" of a variety of both countries' industry sectors. Thus, for example, the research carried out at principle enterprises of Russian space branch shows that the average age of specialists is 48 ÷ 50 years old, in Belarus - 45 ÷ 46 years old accordingly, while the most efficient and inventively active phase of human activity falls on the age period of 25 ÷ 45 years old.

Under these conditions the Russian-Belarusian education and knowledge dissemination system creation within the multifunctional space system framework is becoming an extremely important, topical and long-run objective.

One of powerful instruments to use in such a system for educating, training and retraining specialists is distance education obtaining in the latter days more and more prevalence.

The distance education is called to solve a considerable part of the problems, which have assumed a

global character in the present-day socio-economic environment since the traditional forms of getting education and learning models cannot meet the demands for educational services usually focused in large cities or education centers and getting quickly renewed modern special knowledge which is owned by a limited number of specialists.

With due account for the abovementioned and keeping in mind the perspective of such a mode of study and specialists' training within the framework of the Federal State's multifunctional system for the purpose of the distance education process maintenance support, training and retraining of specialists on polytechnical and humanitarian specialties in the territory of the Russian Federation and the Republic of Belarus, it is offered to create a special earth based complex of the distance education system.

The special earth based complex of the distance education system is destined for:

- the provision of carrying out video-sessions (video-lectures, video-seminars, video-consultations) on the real time basis;
- the provision of telelectures delivery inclusive of the ones on the real time basis with audio-feedback;
- the provision of e-learning organization using textual, audio-visual and multimedia teaching aids both in off-line and on-line modes;
- the provision of off- and on-line testing and knowledge assessment;
- the delivery of audio- and video-information in the direction from the teacher to one student or a group of learners allocated in different educational institutions of Russia and Belarus in simplex mode and duplex (interactive) one with answers to questions (audio- and video-conferences);
- the provision of carrying out experiments from remote laboratories and performing academic assignments on models, mathematical programs using databases of the distance education technical centers;
- the provision of digital information arrays (electronic text-books, reference books, methodical literature, tests, appraisals, etc.), audio- and video records, slides, etc. mapping onto the means of collective and individual user;
- the provision of gathering, processing and keeping all the information necessary for educating;
- the provision of an interactive access to the distributed database;
- the provision of video-lectures creation, electronic educational aids and courses development;
- the provision of information security from virus onslaughts and unauthorized data alteration attempts, database integrity control, non-admission of paid information playback without payment, accounting and control of information payment.

For the achievement of the stated objective and the abovementioned problems solution a distributed network of distance education maintenance centers and group terminal complexes and personal terminals of individual users connected with each other by earth based and satellite channels is being created in the territory of the Federal State.

The first steps in the distance education system creation have already been done both in the Russian Federation and the Republic of Belarus. Thus, in the Research and Development Institute of Space Systems named after Maksimov A.A. a distance education maintenance center has been created, the hardware components of which have provided the carrying out of academic training of specialists in ground control and connection monitoring system for the "KazSat" space system using distant mode of study including such kinds of teaching as case-technologies and video-seminars on the real time basis.

The use of distant mode of study allowed the specialists of Kazakhstan to get quality basic academic knowledge on the ground control and "KazSat" space system connection monitoring system, that has become the foundation for their successful practical training and work on staff facilities. Thereat the economic benefit made ~ 30% from the forecast expenditures at the traditional form of academic education (about $120 000).

Within the structure of the Belarus State University the Aerospace Education Center has been formed for the space activities area specialists training and retraining coordination. In the network of this Center the educational technologies (inclusive of the distance education ones) of personnel training in the branches associated with accepting, processing and practical use of the Earth remote-sensed data, including the total cycle from the space information reception to the topical data obtaining, are developed and approved.

Finally it should be noted that the distance education system creation within the framework of the Federal State multifunctional space system has got important perspectives and it is connected with its use effect lying in:

- the provision of stable Russian and Belarusian educational systems integration;
- the enhancement of getting knowledge by different categories of citizens;
- the enhancement of education contents exchange between educational institutions of Russia and Belarus;
- the provision of employees' training, retraining, educating and testing process continuity on account of distance education high technologies use;
- the advanced training of specialists without primary activity interruption;
- the new specialists' training terms reduction due to specialized education programs use;
- the terms reduction of teaching specialists new technologies;
- putting down expenditures for specialists training.