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THE SPACE NATURAL STUDIES IN THE USSR

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One of important problem of the development of the economy is the comprehensive study of the natural resources, the control for the state of the natural environment, the management of processes of the consumption and the reproduction of the natural resources.

The experimental works in the field of remote sensing of the Earth with the use of means of the space technique which are carried out in the USSR showed the expediency of making the special space system of the study of the natural resources and the environment in the interests of many branches of the national economy.

The space information in comparison with the information obtained by the traditional methods has a series of advantages which principally follow from the peculiarities of the use of the space platform - the altitude and the orbital velocity of flight.

These advantages consist in the following:

- the reduction of the expenditures on carrying out the survey;
- the practically unlimited observation nature (from the local to the global);
- the high effectiveness of obtaining the information owing to the orbital velocity of motion of the spacecraft;
- the possibility of obtaining the data on the hardly accessible regions, for example, - of the North-East of the country, the islands, the aquatories of the seas and the oceans;
- the documentary nature and the objectivity of the information;
- the possibility of the extensive use in the case of the interpretation of information the method of analogy and the application of the highly automated systems of processing; it depends on obtaining and processing under the same conditions the data on the great amount of objects;
- the rise of the labour productivity and the reduction of the expenditures of means on processing the space information owing to the great observation nature and the homogeneity of the files;
- the possibility of making the researches on the principle: from the general to the particular, whereas the traditional methods are mainly based on the systematization and the generalization of the numerous and labourious individual observations.

The analysis of the branches of the technical realization of remote sensing of the Earth from the space showed the expediency of development of the constantly active, multifunctional, compound, multilink system with the high level of the automation of processes of obtaining and processing the information.

The system approach to the formation of concepts of establishment of the national system of the study of the natural resources and the environment allowed to work out the most economical and effective ways of its creation to optimize its informative capacity, precision, effectiveness, reliability under the condition of the most possible complete satisfaction of the needs of the national economy.

The national space system of the study of the natural resources and the environment can include as constantly active or attractive the following basic elements:

- the manned spacecrafts;
- the spacecrafts of "Meteor" type;
- the spacecrafts of "Cosmos" series;
- the aircrafts-laboratories;
- the ground means of reception and the interdepartmental processing of information;
- the mobile complexes for the contact and short-range measurements;
- the stationary means of the contact measurements;
- the network of means and systems of the departmental processing of information.

Take up the purpose of the forming systems.

The manned spacecrafts take the particular place in studying the Earth from the space and together with the fulfillment of many other tasks are intended for carrying out the complex of the experimental, test-production and production works on remote sensing of the Earth, the development of systems of sensing, carrying out the visual and visual-instrumental researches. The first observations of the Earth, the first photo surveys have been carried out from the manned spacecrafts; it gives to natural studies the confidence in the perspectives of the use of the means of the space technique. The space orbital stations of "Saljut" type allow to allocate the complex of different instruments including having the considerable weights, the dimensions and the power supply, to carry out under the compared conditions the realization of the concrete tasks of sensing in the application of different receivers, to develop with the participation of man the optimal conditions of the exploitation of the on-board means of obtaining the information on the Earth.

Many experiments carried out by the cosmonauts on the orbit became a base for forming the technical requirements to the new instruments, the methods of survey, the determination of the new fields of the national economic use of the space technique.

The automated spacecrafts of "Meteor" type at the first stage of the establishment and the exploitation have been carried out the particularly hydrometeorological tasks. The satellites of this type ensure to obtain and transmit the information through the radio channels to the ground receiving stations. The methods of operative obtaining and using the space information in the interests of a series of the departmental tasks were proved and developed on these satellites together with carrying out on them the permanent functions.

The satellites of "Meteor" series were constantly improving, the quality and the resolution of information were growing, the range of sensing was extending; in connection with this the obtained data became to find the more and more application for the study of the rapidly passing natural processes and the decision of the tasks which require the observation nature with the comparatively low resolution.

The satellites of "Cosmos" series are equipped by different instruments for studying the natural resources; they

are intended for the systematic provision for the national economy of the country by the great volume of the high-quality space surveys for the decision of the production and scientific tasks of the prolonged character in the interests of studying the earth surface, the bowels of the Earth, the vegetation cover, the seas and the oceans, the shelf shoal-waters etc.

The aircrafts-laboratories are used in the system of the study of the natural resources of the Earth for carrying out the research works which are connected with developing the methods and the technical means of remote sensing, carrying out the subsatellite (air and ground) experiments, obtaining the information having the particularly high resolution. The composition of instruments and the character of flights are determined by the concrete tasks; as a rule they are frequently changed.

The network of the ground and marine polygons is included in the space system of the study of the natural resources. These polygons are the areas of the earth surface and the aquatories which are selected in the typical physical-geographical zones of the country and are sufficient uniformly allocated throughout its territory. The subsatellite (air and ground) experiments, the complex interdepartmental researches on the development of the means of sensing and the methods of the interpretation of the space information etc. are carrying out on these polygons.

The subsatellite (air and ground) observations are carrying out with the use of the mobile and stationary complexes and the means of the contact and short-range measurements. They allow to develop the technical requirements to the advanced instruments, the approaches of the interpretation etc.

The information of remote sensing obtained from the space is sent to the national interdepartmental centres; after the corresponding processing it is followed to the departmental users for the use in the study of the natural resources and the environment.

The data of remote sensing the Earth from the space have been found the extensive application in the solution of many scientific problems and the production tasks.

Not so much time has passed since the space surveys in the interests of the natural productive forces were begun, however even now there are the essential achievements in the field of the space natural studies.

With the use of the space information some deposits of the ore raw materials and the fuel have been discovered, the study of the timber resources is carried out, mapping of the hard accessible territories is carrying out, the seismic danger is investigated, the ice conditions on the Northern Ocean for steering the vessels etc. are forecasted.

The researches show that the greatest technical-economic effect can be obtained in the complex use of the data of remote sensing of the Earth. The traditionally departmental studies of the natural resources have been carried out by different methods and on different technical bases; as a result the obtained outcomes were of different times, of frequently hard-comparable. The orbital information is multipurpose, of the interdepartmental character, of to be subject to the

repeated use; it becomes the unified technical base on the basis of which the researches of bowels of the Earth, the soils, the vegetation, the waters, the environment etc. which are complex, of inter-co-ordinated, of dated to the appointed period can be carried out.

Under the conditions of the dynamic development of the works on carrying out and developing the large territorial-production complexes, particularly in the Siberia, on the East of the USSR, in the Central Asia such researches of the natural productive forces acquire the particularly great significance.

At the stage of the evaluation of the natural potential of the territory, the determination of the strategy of its economical use, the development of the plans, the projects and the industrial solutions the space survey allows to obtain the objective, comprehensive and operative initial information. The still unknown natural resources can be discovered in the interpretation of the data of remote sensing of the Earth from the orbit using the method of the analogy.

The works on the complex study at the first stage of the inventory of the natural resources show the high technical-economical effectiveness of this method of the researches.

The application of the space information is urgent for the study of the dynamics of the environment for the aim of the nature protection, the reproduction of the natural resources, the rational its use. In the carrying out of the surveys from the spacecrafts with the set periodicity it can obtain the valuable information for the solution of the indicated problems.

The necessity of the creation of the highly efficient systems of processing of the obtained information should be considered one of problem of the space natural studies. Owing the orbital velocity and the high altitude of the flight, for example, in 5 minutes of the flight the area which from the modern aircraft can be surveyed for two survey season can be surveyed. Therefore the urgency of the development of the special industry of processing the space data on the base of the electronic computing machinery is obvious.

The improvement of the extraction of information on the space natural studies from the materials of the space surveys is the important problem. The equipment produced in the different countries as yet allow to interpret only the part of the information on the natural resources and the environment which has in the data of remote sensing.

The advanced means of processing the materials of the space survey, firstly, should meet the problems of the possibly more complete extraction of the information on the space natural studies from the space images and, secondly, should possess the superfast operation that allows within the optimal terms to process the huge files of remote sensing from the satellites.

It is expedient to create the processing technique on the block principle which allows from the separate composites to make the necessary technological flow-productions and to provide for the output of the required information. In addition it is important to provide for the compatibility of the means used in the interdepartmental processing and in the departmen-

tal interpretation.

The development of the new bands of the electromagnetic radiation, the application of the active location, the use of the all-weather systems of obtaining the information are the important problems of remote sensing of the Earth.

The tendencies of the development of the space natural studies are such that this branch of the study of the natural resources in the very near future should acquire the still greater significance for the development of the economy.

The extensive possibilities of development of the international collaboration contain in the global character of the space engineering. Therefore the Soviet Union which is guided by the aspirations to develop and strengthen the international collaboration in the study and the use of the outer space for the peaceful aims in 1977 stated in the UNO on its desire to put the achievements of own space science and engineering in the field of remote sensing of the Earth from the space for the service of the international community.