

**RUSSIAN CARTOGRAPHIC AND GEODETIC SERVICE
AT NEW STAGE OF DEVELOPMENT**

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Abstract

Historic development of Russian Cartographic and Geodetic Service is described, as well as main tasks faced by the Service in connection with remarkable changes in the economy of Russian Federation.

As the new independent nations, former Soviet Republics emerged, the activity of unified Cartographic and Geodetic Service of the USSR was terminated from 1st January 1992. However the political and economic developments in these states called for formation of National Cartographic and Geodetic Services. The process of their formation was completed in 1992. The newly formed National Services were based on cartographic and geodetic agencies and their surveying and mapping potential was different.

The National Cartographic and Geodetic Service was created in Russia as well. The Main Administration of Cartography was established by Government Decree on 20th April 1991 (Glavcartographia of the RSFSR). It took under its authority 19 surveying, mapping and mine-surveying agencies and associations, three map printing factories, Experimental Optical Mechanical Plant, Central Science Research Institute of Geodesy, Aerial Survey and Cartography (CNIIGAik), National Science Research and Production Centre "Priroda", Science Research Institute of Applied Geodesy (NIIPG), Productive Map Compiling Association "Cartographia", Central Cartographic and Geodetic Archives, 12 Inspections of the State Geodetic Surveillance, five Surveying Colleges. These imposing starting positions made the State Cartographic and Geodetic Service of Russia self-dependant from the very beginning and it is fully capable to perform the whole complex of surveying, remote sensing and mapping operations within the territory of Russia. However the productive capacities of the map printing factories are far from being sufficient to fully satisfy the nation's needs in cartographic materials. Besides all the factories specially equipped for plastic relief maps and globes production turned out to be outside Russia.

The agencies, associations and organizations are headed by experienced leaders, and the skill of personnel is high, but technology level is far from being perfect. In spite of a wide application of modern space remote sensing technology with multiband and false-colour sensors being at the same level or better than abroad, the Russian Service is lagging behind in the field of Global Positioning Systems, banks of digital and electronic maps, geoinformation systems (GIS), digital photogrammetry and analytical photogrammetric instrumentation. At present effective measures are being taken to overcome this handicap.

The Federal Service of Geodesy and Cartography of Russia exists for three years, but how old is National Service of Geodesy and Cartography of the Russian State? This question was discussed many times at our Board Sessions, but no sound solution was found. If we take only the period of Soviets then the day of foundation of the National Service will be the signing of Sovnarcom Decree On the Establishment of Highest Geodetic Administration, that is 15th March 1919. However the development of surveying and mapping activities in Russia has deep historic roots. The first precise instrumental surveys were started in 1715 under the guidance of the Russian Academy of Sciences according to the Decree of Peter I. Later Geographic Department was established for this purpose, which existed till 1800. In 1797 the Depot of Maps was established as the military surveying agency, which collected, compiled and published maps and made all kinds of surveys within Russia's territory, as well as surveillance of all surveys performed by other departments. In 1822 the Corps of Military Surveyors was established under the authority of the Main Staff. The Corps performed a large amount of national surveys, triangulation and levelling. There was a Statute of Corps of Civil Surveyors, which was established under the Committee of State Property. The Corps was to make land surveys, real estate inventory and cadastre, but no substantial traces of its activities were found. Besides military departments, many civil organizations performed surveying and mapping in various periods. Their efforts were uncoordinated and did not make up a single whole for the Nation. Hence the Board of Federal Service taking into account unsufficiency and variety of historical information on surveying and mapping in Russia, resolved that 15th March 1919, the day of signing the Decree of Soviet People's Commissars On Establishment of the Highest Geodetic Administration

should be considered as the day of formation of National Civil Surveying and Mapping Service. It would be helpful to continue investigations and search of historic documents to determine the date of establishment of Russian Surveying and Mapping Service. This job could be done by veterans, scientists and professionals.

Formation and development of the National Surveying and Mapping Service of the USSR continued 76 years. Tremendous amount of work was done for mapping the country, compiling topographic, thematic and special maps and atlases for the national economy, defence, science and education. Selfless labour of geodesists, surveyors and cartographers brought our nation in the field of surveying and mapping to the level of foremost nations of the globe.

At the territory of the former USSR a high precision geodetic control network including 370 000 points evenly distributed all over the country was established. A high precision levelling network was developed in the continental parts of the country, which extended the Baltic system of altitudes all over the country. The first class gravimetric network was established with density one point per 100 000 sq. km. It is continuously being developed and densified. The country is fully covered with 1: 25 000 - 1: 1 000 000 topographic maps, and about 25 % of the whole territory is covered with 1:10 000 maps. All the cities and towns, industrial zones are covered with 1: 5 000, 1: 2 000 and larger scale maps. The whole territory is covered with 1: 1 000 000 gravimetric survey, and 80 % - with 1: 200 000 gravimetric survey. The continental shelf and many sea areas were covered with 1: 1 000 000 gravimetric surveys. The density of control corresponds to the requirements established in manuals and instructions. Map revision of all scale maps is done continuously.

The results of National Cartographic and Geodetic Service's activities show sufficiently high level of surveying and mapping for the benefit of national economy and defence.

At present Roscartographia is central organization of the Federal Executive Government, which performs special executive, control, authorization and surveillance functions for geodetic, astronomic geodetic, gravimetric, topographic surveys and topographic surveys and geodetic works for mining, remote sensing, cartographic, map printing and cadastral operations,

digital and electronic mapping and geoinformation systems (GIS).

The main tasks of the Federal Service are:

- realization of a uniform and homogeneous national policy and management in surveying and mapping;
- implementation of surveillance and control for maintenance of the established requirements when various organizations carry out surveying and mapping operations, independently of their organizational and legal statute, and control of results of these operations.

Besides conventional tasks, the Federal Service encounters new important challenges caused by the science-technical progress and new political and economic situation. These tasks were never solved by the former Main Administration of Geodesy and Cartography of the USSR.

As the new independent states at the former USSR territory emerged and a new Constitution of the Russian Federation was adopted, there appeared a new and urgent task of surveying and mapping for delimitation, demarkation and control of the national boundary of Russia, and boundaries of subjects of the Russian Federation inside the country. This task is new for Roscartographia.

The total length of the national boundary of Russia is about 70 000 km, including sea and taking into account islands. Somewhat more than 5000 km. of the boundary line had been demarked and officially documented as it is usually done in international relations. These are boundaries with Norge, Finland, Poland, Mongolia and Korean People's Democratic Republic. In the nearest future Russia will have to define the boundaries with the former Union's Republics, as well as with other countries where they had not been fixed before.

The boundary delimitation is carried out in the course of international negotiations on the boundary line positioning, which is placed on topographic map, reflecting present state of land features. Demarkation is done by fixing on the ground of the delimited boundary and by compilation of the demarkation maps with plotted boundary. The negotiations on definition of

borders are being carried out with a number of neighbouring nations. Because of large amount of work and their urgent character the surveying and mapping for boundary demarkation should be done using new technologies and instruments. During 1992-1994 state boundary delimitation was done with Latvia, Estonia, Litvania, Georgia and Azerbaidjan.

Growing demand for up-to-date information for management, planning and development of the national economy and widespread inculcation of new technologies and computers set before Roscartographia new challenge to create federal and regional cartographic and geodetic archives, banks of digital and electronic maps, cadastre, surveying data, and geoinformation systems. To provide the governmental bodies of management, economy and defence with modern automated geoinformation systems based on digital cartographic data by the Decree of Government of Russian Federation, Russian Science - Productive Centre of Geoinformation was established in Moscow. Regional centres of geoinformation had been organized in Ekaterinburg, Novosibirsk, Sankt-Peterburg, Irkutsk and Khabarovsk.

The digital map in these centres is proposed to be made by two ways: (1) digitising map originals and (2) photogrammetric processing of air and space imagery.

The problem-oriented GIS based on cartographic, surveying and remote sensing data in digital form and supplemented with multiform special information, addressed to a particular user, open for GIS wide applications for solution of a number of federal, regional and multibranch tasks. Information in digital form can be successfully used in structural reformation of economy, rational use of natural and material resources, management, land use, environmental protection, defence, analysis of social processes, transportation, planning and management, regional and urban management, civil engineering, etc. The vast financial resources which will be spent for digital mapping of Russia program might be repaid and bring social and economic benefits only if digital information will be widely used through geoinformation systems. The task of Federal Service will be to plan and realise together with other ministries and departments ways of use of digital information and GIS, and to determine their possible users.

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ought to coordinate efforts aimed at creation of bank of national digital territorial cadastre, unification of the standard surveying control, system of classification, coding and structure of information presentation. It is very important question, and if it will not be solved, the exchange by multiform information between various levels of governmental structures, regions and branches of national economy for coordination of management efforts by the whole state and separate regions will not be possible.

For further development of planimetric geodetic control one must bear in mind that conventional methods become unefficient and expensive. They practically exhausted their potentialities and they can not provide solution of tasks set before the Federal Service. Global positioning systems (GPS) open new possibilities. GPS receivers of Trimble, Astech, Leica, CerCEL are widely used all over the world. They receive signals from Navstar satellites. For our needs we must buy these receivers abroad, at the same time continuing elaboration of home-made apparatus for GLONASS system. The GPS technology allow to reduce cost of the national control network maintenance, considerably decreasing the number of points.

In connection with disintegration of the USSR the most of published during its existence maps and atlases ought to be revised and republished. The country portraied on the maps changed considerably, and there are many new geographical names. The correct plotting of state boundary line (instead of republican border in the former USSR) becomes very important, as well as plotting of boundaries between the subjects of the Federation. Great efforts are to be made for maps and atlases revision and republication, and this calls for transition to new progressive technologies and hardware.

Legal base of surveying and mapping activities in our country is urgently needed under conditions of market economy. During 76 years of existence of the state cartographic and geodetic service there was not a single law in this field. Under conditions of planned socialist economy there was no need in such laws. All the surveying and mapping activity in our country was regulated by a single normative technical base and by the state surveillance. At present there is a legal vacuum in this field and there is a loss of surveying and mapping information. Private companies publish various maps and schemes, make plastic globes, carry out

field observations. Often their products are of low quality and they do not correspond to the requirements of normative documents. It is necessary in the nearest future to eliminate the gap in legal acts. At present the law on surveying and mapping activities is being prepared. At the same time a number of legal acts should be prepared: on state geodetic and gravimetric control, on scales of the state topographic maps and their content, on property rights of geoinformation, etc.

Taking into consideration expansion of rights of Federation's subjects, there is a growing demand to redistribute responsibilities at the federal, regional and local municipal levels. In the new Constitution of Russia surveying and mapping is referred to the federal authority. Such global problems, as geodetic control network revision and support, topographic and thematic maps revision, digital data banks development, Earth remote sensing from space, and some others should be solved at the federal level within frameworks of national programs. However a number of responsibilities should be probably passed on to the Federation's subjects. First of all we mean large scale mapping and development of local geodetic control networks. For this legal acts should distribute the responsibilities of state and private companies and amenability for final products.

Last years by state legislation the state cartographic and geodetic service was not liable to privatization. At present the situation is changing, and only those organizations would not be liable to privatization, which support the unity of technological processes of observations and data preparation.

The Federal Service is continuing its efforts in international cooperation. Besides exchange of experience we try to transfer this cooperation into practical work. As a result agreements were signed for joint elaboration of geoinformation systems "GIS Baykal" (with USA), "GIS Sever" (with Finland) and GIS Ryazan" (with Canada).

These projects are supported by our foreign partners, and producing capacities and personnel is provided by the Federal Service of Geodesy and Cartography. Extension of economic relations with foreign partners is to be worked up.

XVIIth Congress of International Society of Photogrammetry and Remote Sensing in August 1992 in USA took a decision to accept Russia as its member. At the last meeting of Permanent Committee of International Federation of Surveyors (FIG) in Spain in September 1992 a decision was taken that Russia will take place of the former USSR in FIG. In May 1993 at 16th Conference of the International Cartographic Association (ICA) Russia was recognized as legal successor of the former USSR in ICA. The Federal Service of Geodesy and Cartography will expand its activities in international science-technical and economic cooperation.

Realization of the above measures would expand the surveying and mapping capacities of the Federal Service to meet the challenge of the tasks which are in prospect, and to promote surveying and mapping support of reforms in the Russian Federation and formation of market economy.