

## Near real-time monitoring from space for land use planning information support

Nowadays the Earth remote sensing technique becomes the main source of supplying spatial data for information support of important strategic tasks, such as land use planning. There are about 30 commercial satellites currently operating and the market of spatial data and GIS-applications has finally been shaped. It's common knowledge that the local remote sensing market has its specific features that has an adverse impact on the development of many branches, land use planning inclusive. For a long time the factors retarding the Russian spatial data market development was an obsolete regulatory basis and the lack of up-to-date and affordable RS data. If regulatory issues have undergone dramatic changes lately, the high resolution imagery data is still being supplied from abroad using methods not encouraging a cheaper spaced data delivery.

Quite inexpensive middle, high and extra-high resolution spatial data available in near real-time for the entire Russian territory is required for the land use planning information support. ScanEx's experience shows that if several space systems are operating in continuous real-time imagery mode, it will take 6-9 months for the complete coverage of the Russian territory (17 mln sq. km) with middle resolution images.

Cheaper data can be obtained by importing "raw" telemetry of the leading foreign RS programs to the network of ground receiving stations in Russia. As compared to the purchase of end-products, direct readout provides for a 20-30% decrease in costs of space images for the clients, whereas it means a decrease in times for the owners of ground stations.



**UniScan ground receiving station at the Moscow Center of ScanEx**

The scheme of direct RS data readout used by several remote sensing programs is added by a network of regional RS center with universal small-size UniScan receiving stations that ensure the reception from 12 operating satellites of different RS operators in X-band with a spatial resolution from 0.7 m to 1 km.

As per license agreements of 2006, only SPOT-2,-4 (France) and Landsat-5 (USA) satellites delivered images of the Russian territory with middle resolution in continuous mode. The raw data is acquired by the first

Russian commercial network of three UniScan ground receiving stations, located in Moscow, Irkutsk and Magadan. Any regional center that will be upgraded with proper equipment as per license can join this network



**Peat field area in Kaliningrad Region (SPTO-4, 10 m, June 16, 2006)**



**Nizhnesvirsky strict nature reserve and the economic area along the Svir river (Landsat-5, 30 m, August 8, 2006)**

Almost the entire Russian territory was covered by up-to-date images of middle resolution (10, 20 and 30 m) in 2006. The data archive is available for preview at <http://catalog.scanex.ru>. SPOT-2, -4 and Landsat-5 satellites images enable to update the digital topographic 1:200 000 and 1:100 000 maps. Russia has acquired practical experience of such works: "Uralgeoinform" Urals Regional Production Center has updated the maps of the Yamalo-Nenets Autonomous District with the acreage of 20 thousand km<sup>2</sup> basically without doing any field survey.

The data of the Indian IRS-P6 satellite, received from the 5.8, 23 and 56 m resolution scanners will be the best solution for the cadastral mapping of some lands. For example, when mapping the agricultural lands the IRS data revealed that about half of the lands are withdrawn from the commercial use. The large archive of recent PAN and LISS-4 images (5.8 m resolution) can be used to update 1:25 000 and 1:50 000 maps.

Currently the most promising and quickly developing segment of the RS data market is the one with high (1-10 m) and extra-high (less than 1 m) resolution images. Despite the steady demand, high resolution imagery data are the most expensive and the least operational. Technological solutions of the ScanEx R&D Center enable to order and

receive high and extra-high resolution images of IRS, EROS A and EROS B (Israel) programs in near real-time mode by the regional ground receiving centers. In 2006, the UniScan station acquired first EROS B images of submeter resolution. Negotiations on Formosat-2 (Taiwan) 2-m satellite and KOMPSAT-2 (Korea) 1-m satellite imagery reception are ongoing. In the nearest future 2.5 m stereo pairs reception from Cartosat-1 (IRS-P5, India) satellite will be initiated.



**Urban planning images from EROS B (0.7 m resolution)**

With the help of high resolution imagery it will be able to create arable lands maps at as scale of 1:25 000 in compliance with the Federal target program “Creation of the automated system of state land use planning and real estate inventory (2002-2007)” and the subprogram “Creation of the real estate cadastre (2006-2011)”. The anticipated removal of legal restrictions on the use of foreign RS data will expedite the introduction of new technology of real-time access and will reduce prices on space information.

For the benefit of land use planning information support, it is expedient to create multi-purpose ground receiving stations in the regions with local archives of data from different RS programs. Irkutsk and Chita centers can be mentioned as a example. They are equipped with universal receiving stations, local data archives and with a variety of GIS-applications development assets and high processing level products. Thus for example, the Irkutsk Earth remote sensing center is equipped with a small-size UniScan station providing for the acquisition of Terra, Aqua (USA), SPOT-2, -4, IRS, Landsat-5 and EROS A satellites data at a resolution from 2m to 1 km. Even more advanced regional center is being created based on the ScanEx technology in Samara.



**Arable lands on the territory of Poland and Kaliningrad Region of RF (IRS-1D, LISS-3, 23 m, June 18, 2002)**

Near real-time data reception to a network of regional stations will enable to meet the demands of the Russian market for different and affordable products and to diversify space images practical applications including to the benefit of regular land use planning and 1:200 000 – 1:10 000 digital maps updating.