

THE LOCAL MONITORING SYSTEM "BIOSPHERE TM".

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ABSTRACT

The paper describes the new designed local monitoring system "Biosphere TM" which permits to carry out remote sensing data acquisition and processing in order to solve a wide range of problems in the sphere of ecology, land management, thematic mapping, agriculture, hydrology, geology on the areas till 100 sq.km.

The system consists of:

- a superlight flight vehicle equipped with remote sensing systems;
- a mobile station of data processing, energy and life support of the crew of 3 persons;
- equipment for ground observations.

The complex of the airborne equipment "Biosphere TM" designed permits to carry out

- spectrozonal, colour, black- and- white aerial survey (frame size 18 x 18 sm, scale 1:1000 - 1:10 000) with the help of the topographic long focal length aerial camera;
- a perspective and planned colour TV survey in theformats of SVHS and Betecam with the help of professional camcorders SONY;
- air lane radiometric survey in the microwave, near and far IR with TV control and registration in the digital form.

KEY WORDS: Land condition estimation, Thematic mapping, Aerial survey.

Russian Project-research Institute of the Land Cadstre Survey completed on the conversion base the developing of the local monitoring system intended for carrying out remote sensing data acquisition and processing in order to solve a wide range of the problems in the sphere of ecology, land management, thematic mapping, agriculture, forestry, hydrology and geology.

A highly effective application of the local monitoring system "Biosphere TM" is provided with the technologies approved in the different Russian regions by solving practical tasks on the following directions:

- updating of the planned-topographic base of the rural settlements;
- making of the outline land-use plans;
- cadastre implementation and land condition estimation;
- coplex thematic mapping;
- ecological examination of the industrial objects;
- control of the infracture objects conditions (transport lines, electrototransmissin lines, oil-pipe lines and gas mains);
- control of hydrotechnical and land reclamation objects conditions;

- creation of educational and scientific colour videofilms.

The system includes:

- a superlight flight vehicle - motor glider, equipped with the topographic aerial camera ($f=100$ mm); frame size 18×18 cm, professional camcoders (Betacam, SVHS) and the blocks of the laser radiometers operating at the different wave lengths (microwave, near IR).

Operating of the survey systems is carried out with the help of the self-syn drive from the pilot helmet.

Registration TV and radiometers data is carried out in the digital and analog forms. Aerial topographic data is represented with the use of black-and-white, colour and spectrozonal films, designed on the high technology base.

Airborne remote sensing systems are placed on the pendulous gimbals for damping of the vibrator and shock loads.

Satellite navigation and stabilized energy power of the airborne systems is used as an additional subsystem.

The flight testing of the superlight flight vehicle has been carried out at the test site area (strip wide - 7 km, length - 20 km).

Flight routes with 614 photos, 60x25% overlapping at the scale 1:5000 have been made and also 14 routes with 87 photos, 80x10% overlapping at the scale 1:2000 is made.

Data photo processing and testing have been carried out on site field laboratory.

Analyses have shown that airsurvey motor glider is met the requirements of the large-scale airsurvey carried out for the creation of the topographic plan and project research works on the small areas (till 100 sq.km).

Metric and graphic characteristics received airphotos are rather high quality.

So, the accuracy of making plans at scale 1:1000 using 1:5000 is characterized by position error of the control points and is equal 0.035 mm in the photoscale and the relative error of the point heights is 1:5000 of the height of the flight.

Radiometric equipment (radiometers operating at 2, 6, 18 and 21 cm wavelengths) is allowed to determine the soil humidity, depth to a shallow water table, type and biomass of vegetation.

Software for plan plotting and GPS position is designed.

The scale of the thematic maps is ranging from 1:2000 to 1:10 000.

The system consists of:

- a superlight flight vehicle - "Poisk-06";
- a mobile station of data processing;
- a topographic camera T9-100m;
- focal length of camera 100 mm and resolution 18 lines per mm;
- TV system in the SVHS and Betacam formats;
- radiometers operating in the microwave (2, 6, 18 and 21 cm);
- a mobile photolaboratory;
- a two-posted mounting lab of colour TV information;
- computers of the automated processing and output information registration;
- complex ground instrumental measurements.

The total weight of the system does not exceed 350 kg.

Technical characteristics of "Poisk-06":

- a speed 40-70 km/h;
- the altitude range 50-3000 m;
- the take-off run 40-70 m;
- fuel consumption is less than 25 l for 100 km flight;
- flight endurance 2 hours.