A SYSTEM FOR REMOTE SENSING INVESTIGATIONS TO BE CARRIED OUT SIMULTANEOUSLY WITH THE PASSING OF A SATELLITE

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Airborne data acquired from platforms operating on various altitudes lower than that of as satellite are indispensable for the proper interpretation of satellite images of the Earth simultencously with the passing of a satellite over a particular territory creates however, many practical problems. Since 1978 such experiments have been carried out several times in Poland within the frame work of the Intercosmos programme [1]. Imagery was acquired from the Soviet aircraft- laboratory AN- 30, precise synchronization in data acquisition has not been achieved between the aircraft and either Salut or Landsat /Fig.1/.

A concept of utilization of a mobile airborne data acquisition system for satellite synchronous experiment has been developed. This new mobile system ensures proper synchronization with a satellite and not only data acquisition but its preprocessing directly in the field. The mobile unit would provide imagery from the lowest level and constitute a part of one of the two main remotely sensed data sets:

1. Images acquired by multispectral camera MKF-6M from orbital stations Salut-6 and Salut-7 comple-mented by lower altitude up to 7 km imagery acquired with the same camera from a Soviet aircraft AN-30. The lowest data acquisition platform /up to 600m/ consists of a powered hang glider with remote radio control equipped with multispectral mini camera MB- 470 NAC [2]. Auxiliary information from a ground level consists of multispectral images and the results of spectrometric measurements.
2. Landsat MSS imagery complemented on intermediate altitudes by images acquiered with the MB- 490 NAC camera, and on lower altitudes by products acquired by means of MB-470 NAC camera mounted on the powered hang glider.

Mobile airborne data acquisition system should enable:
- acquisition of imagery in full synchronization with the passing of a satellite,
- processing of images directly in the field /including photochemical treatment, the elaboration of colour composites, density measurements/,
- full compatibility of the processed data with data from higher altitudes.

The system for remote sensing investigations to be carried out simultaneously with the passing of a satellite is schematically shown on fig.2.

The acquisition of imagery, data preprocessing, interpretation and checking is carried out directly in the field.

The equippment of the expedition consist of:
- minibus with laboratory equipment,
- a powered hang glider,
- multiband camera MB- 470 NAC,
- photogrammetric camera MK- 70 Hasselblad,
- photographic camera 500 EL Hasselblad,
- mini additive colour viewer AC- 70 NAC,
- microdensitometer TRD- 04 Meodenzi,
- spectrometers,
- mini power generator 220 V Honda.

The vital part of our system is a powered hang glider with a Rogalo type wing. It is easy to operate, it maintains very low forward speed in flight, it can be folded and transported easily and finally, it enables easy mounting and dismounting of cameras.

The flight of the powered hang glider is controlled by radio and servomechanisms. Varioprop devices produced by Grundig are controlling the direction and the altitude of flight as well as its speed by adjusting motor rotations. The control of the model is performed by means of a seven - band Grunding transmitter.

Photochemical treatment is carried out immediately after the acquisition of imagery. Optical density measurements are perfomed on negatives with the use of portable numerical micro densitometer TRD- 04.

Multispectral imagery acquired with NAC MB- 470 camera is most often processed with the help of mini additive colour viewer NAC AC- 70; the resulting colour composites being best suited for further work. The colour composite is photographed from the screen on colour negative or positive film. Prints / 18 x 18 cm/ are often obtained directly from the screen. These materials are used for visual interpretation.

In the field conditions, however , the results of a quick visual interpretation are transfered from the screen of AC-70 onto transparency. This assessment facilitates decisions as to additional field checks to be carried out immedietely and helps to pinpoint the sites for ground sample acquisition and spectrometric measurements.

The results of this interpretation serve for the creation of - photointerpretation key for images acquired from other altitudes.

The described mobile system can be applied also for experimental measurements on very small surfaces, for example research on vegetational cycle. Whereas the application of a helicopter or an aircraft for such measurements would be unjustified for both economic and organizational reasons, the mobile unit serves purpose very well and the completion of various reasearch projects.

The system can also be applied for archaelogical research for surveying pollution of small water bodies as well as for photogrammetric elaborations of small objects.

The system was tried out during the Intercosmos remote sensing experiment "Telefoto- 82" and for works on the application of remote sensing for crop recogn-ition.

The system has been improved and modernized on the basis of the acquired experience. It is now operational and indispensable during all satellite synchronous data acquisition projects.

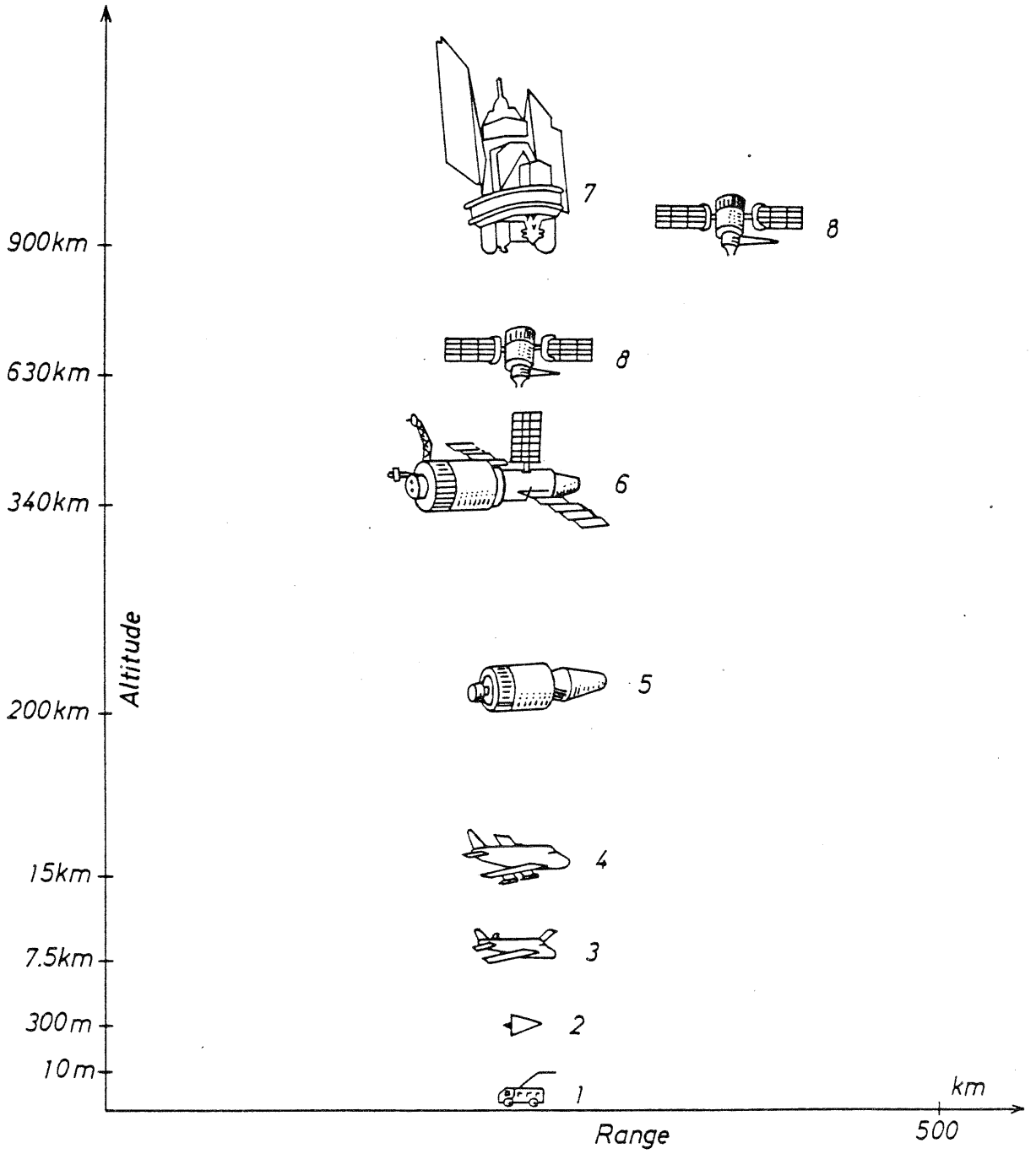

Fig.1. 1- spectrometric measurements, 2- hang glider, 3- aircraft AN- 30, 4- aircraft, 5- KOSMOS, 6- SALUT -7, 7- LANDSAT, 8- METEOR -Priroda.

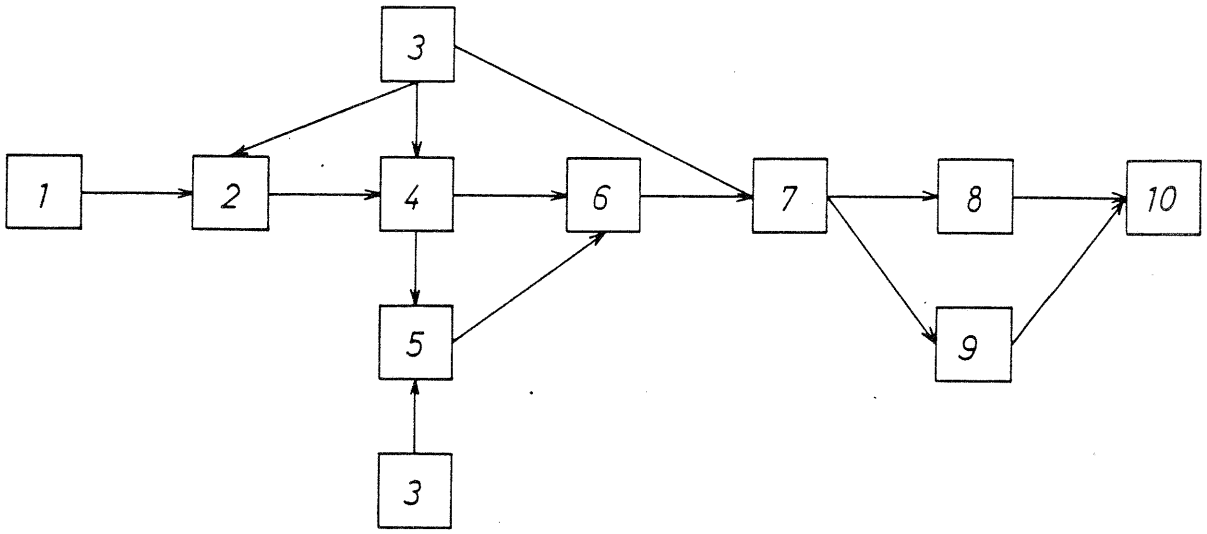

Fig.2. 1- data acquisition, 2- photolaboratory, 3- power supply 4- microdensitometr, 5- colour composite, 6- data interpretation, 7- field checking, 8- spectrometric measurements, 9- ground sample acquisition, 10- photointerpretation and key elaboration.

Bibliography

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2. Ciołkosz A., Nowosielski A. Photographs taken from a balloon and a powered hang glider. Proceedings of the Institute of Geodesy and Cartography, Vol.XXIX, No.2, 1982.