

**NATIONAL REPORT OF POLISH
SOCIETY OF PHOTOGRAMMETRY
AND REMOTE SENSING**

(Period: Jan. 1980 - Dec. 1987)

This report has been compiled by: Ryszard Florek, Jozef Jachimski, Romuald Kaczyński, Władysław Mierzwa, Stefan Papiernik, Ryszard Preuss, Zbigniew Sitek, Andrzej Świątkiewicz, Jacek Uchański and accepted by the Council of the Polish Society of Photogrammetry and Remote Sensing.

C o m m i s s i o n V I

1. Topographic Operations

P r o j e c t s e x e c u t e d

Topographic operations in Poland are executed exclusively by state enterprises. The aerial photographs are taken by one enterprise which delivers the photos to the eight regional enterprises.

New maps are now produced only in the following scales: 1:5000 to 1:500. The area covered by these maps differs in each year e.g. in 1981 they covered 5893 km², while in 1987 only 1380 km². The maps in scale 1:5000 are plotted for 50% of mapped areas, 1:2000 for 34% 1:1000 for 11% and 1:500 for 5% of areas being mapped. As the full coverage of the whole country by maps in scale 1:10000 was achieved in 1974, only revision of these maps is being done now. An average of 30 000 km² of these maps is revised each year.

P h o t o g r a p h i c c o v e r a g e

For large scale mapping and for photointerpretation purposes, the panchromatic aerial photographs in scales from 1:4000 to 1:18000 are mainly used. The number of taken photographs depends mainly on weather condition which limits the number of days appropriate for photogrammetric flights.

The area covered by these photographs vary in each year. For instance in 1981 area of 4980 km² only was covered, while in 1987 17 213 km². Furthermore each year the area of 30 000 km² for 1:10 000 maps revision, the photographs in scales 1:18 000-1:35 000 are used. Moreover, in each year an average area of 120 km² is photographed on colour infrared film, area of 320 km² is covered by multispectral photographs, and for area of 1000 km² a thermal scannerimageries are taken.

I n s t r u m e n t a t i o n

In Poland the following frame cameras are used: Wild RC-8 and RC-10, Zeiss Jena MRB, Multispectral-Zeiss-Jena MSK-4 and Japan NAC.

For analytical solutions, the following precision stereocomparators are used: Zeiss-Jena stecometers and Opton PSK-2 stereocomparators.

For map compilation the following stereoplotters are used: Wild A10 and A8, Zeiss-Jena Stereometrographs, Stereoplanigraphs and Topocarts.

Manpower

Majority of photogrammetric staff have high or technical university education.

2. Non-Topographic Operation

The non-topographic applications of photogrammetric methods concern various domains of the national economy and science. The photogrammetric methods have found in Poland many applications for mining, industry and other purposes such as:

- measurements of dislocations and deformations of industrial and mining constructions (e.g. a gasholder, gantry pillar, boring tower, coal bunker, roof trusses of industrial halls, radar antenna;
- terrophotogrammetric measurements of an TV mast to determine tension forces of guy-ropes;
- application of single-image photogrammetry to examine sewerage pipeline deformations;
- investigation of a model of a river bottom using stereophotos taken with UMK 10/1318 through water;
- photogrammetric measurements of water waves on hydrotechnic models;
- volume determination of excavated masses on open pits by analytical photogrammetry;
- application of analogue or/and analytical photogrammetric plotting for revision of data on open pits;
- investigation of ship launching process;
- determination of geometry and density of powder spreaded out by a jet fire extinguisher;
- diagnosis and monitoring of rehabilitation process by stereophotogrammetry and "Moire technique" in medicine;
- stereophotogrammetry measurements of photomicrographs taken with an electron microscope;

There were applied different methods and ideas as:

- development of the method based on time parallax concept for photogrammetric determination of displacements;
- technology of photogrammetric determination of the building displacements based on block adjustment of the stereophotograms taken from a time base;
- attempt to substitute the glass plate 13x18 cm by a cut-film in the terrestrial cameras UMK;
- using of non-metric cameras for investigation of model of physical phenomena or objects.

Moreover, "Technical Instructions" for documentation of monuments of architecture" was published in Poland in 1981. It gives a main lines how to measure and present: urbanistic and architectonic units, small architecture, interiors and furnishing, details, historical sites, etc. The instructions contain methods and technologies, accuracy requirements, and some examples of final drawings.

Non-topographic projects have been carried out by photogrammetric sections or institutes of universities, technical or agriculture academies, state and local enterprises. Totally, about 20 units are involved in non-topo photogrammetry in Poland. Following cameras have been used: Zeiss Jena UMK, Photheo, Wild P30, and non-metric cameras. Photographs are measured mainly on Zeiss Jena stereocomparators as stecco 1818 and steccometer, and are plotted on different analogue instruments of Zeiss Jena or Wild Stereoplotters.

3. Remote sensing activity

The main activity in this field is carried out at the Polish Remote Sensing Centre (OPOLIS) - department of Institute of Geodesy and Cartography Warsaw. Some activity take place at the universities in Cracow, Gdańsk, Olsztyn, Poznań, Stettin, Warsaw and Wroclaw. Interesting remote sensing applications (including close-range methods) have been done by regional surveying enterprises (KPG-Cracow and OPGK-Stettin).

OPOLIS has been established in 1976. The modern methods of data acquisition and analysis are applied. MSS, TM Landsat, SPOT data as well as Soviet satellite photographs are basic source from space for interpretation. Airborne data including panchromatic, colour, colour infra-red and multispectral as well as thermal photographs have been also used in Poland. For analog data handling the following equipment is available: - stereoscopes, interpretoscopes, zoom-transfer-scopes, stereo-comparators Zeiss Jena and Zeiss Oberkochen,

- microdensitometers,
- optical additive colour viewers AC-90, AC-70 NAC, MSP-4 Zeiss Jena, - analog and electronics Multi Colour Data processing System NAC.

Digital Data processing is based on the 2 PAAC System (OVAAC8) which is used for interactive analysis of multispectral digital and analog data. Microcomputer IBM PC/AT are used for digital interpretation of data collected on a floppy disc or CCT. The following thematic and topographic work have been done:

- map making and updating in the scales 1:500 000, 1:200 000, 1:100 000, 1:50 000 using TM Landsat, SPOT, Soviet satellite photographs,
- rock discrimination, mineral resource evaluation, natural hazard assessment, landforms mapping,
- ground water targeting, hydrographic mapping,
- vegetation monitoring, crops classification on the basis of statistical methods, forest sanitary, forest economic classes determination,
- land use inventories, site investigations, soil investigations,
- pollution assessment, landscape disturbance detection.

A few remote sensing experiments named TELEFOTO and TELEGEO have been done so far in Poland since 1977. Different kind of equipment and level of data collection have been used simultaneously: MSS, TM Landsat, SALUT-6 orbital station, aircraft (2.5 - 10 km) equipped with RC-10, MKF-6, MSK-4, MB-490 NAC Cameras; helicopters with spectrometers, in the field ground data collection has been carried out. OPOLIS is an interdisciplinary research and application institution; it employs following experienced specialists: photogrammetrists, cartographers, computer electronics experts, geographers, agricultural and forest interpreters. The OPOLIS organizes the low-cost training courses in the field of remote sensing applications. OPOLIS teams have also run the projects in the following developing countries: Vietnam, Mongolia, Cuba, Libya, Algeria, Somalia, Iraq, Sudan, Turkey, Nigeria.

4. Research and Development

a) A new method of photo-triangulation adjustment, called PHOTONET 86 has been developed. The method is based on simultaneous adjustment of geodetic and photogrammetric measurements with refinement of exterior orientation elements.

b) Adaptation of the stereocomparators (Zeiss Jena Steometer Opton PSK-2 and mechanical plotters (Wild A-8 and A-10) to the analytical purposes through connection to the IBM PS computers in on-line procedure.

c) Zeiss Jena stereocomparator STECO 18x18 was provided with analogue-to-digital converter for automatic measurements registration.

d) Counters to Zeiss Jena steometer C was constructed which is used instead of Coordimeter F.

f) Two systems of aerotriangulation adjustment have been developed: first called AERONET is based on the method of independent bundles and uses IBM PC XT/AT computer, second called BUND is based on G. Schut method of independent bundles.

g) For satellite photographs triangulation SPACE BLOCK SYSTEM was developed.

h) For analytical aerial triangulation measurements using precision stereocomparator connected with microcomputer - system NADZÓR SG of supervision of observations was developed. The similar system NADZÓR AG for semi-analytical aerial triangulation was also prepared.

i) For numerical on-line processing system MASÓWKA SG was developed based on precision stereocomparator, microcomputer and known (from adjustment of aerial triangulation) orientation elements of photographs. The similar system MASÓWKA AG but based on analogue stereoplotter and independent model measurements was also prepared.

j) The calculation algorithms was programmed on various computers: PARABLOK - for determination of the displacement based on block adjustment of pseudostereograms taken from time base; STEREOGRAM - analytical model solution with simultaneously executed conditions of collinearity and coplanarity; KALIBRACJA - program for field calibration of terrestrial and aerial cameras; KOREKCJA - program for geometrical corrections of TV, radar and scanner imageries.

k) The set of programs: KP25-KP29, SPOC: DMT, TRIN, FOTO for geometric corrections of aerial scanner imagery have been also developed.

l) Various programs for volume computations, based on DMT, for processing of terrestrial photographs and similar computations, have been worked out.

m) Zeiss-Jena Topocart B/Orthophot B and Topocart C/Orthophot C instrument systems were modified. Now these instruments are

used for production of stereomate also.

n) For measuring of visible and near infrared radiation the the spectroalbedometer was constructed.

o) The technology for orthophoto production base on differential rectification of digitized aerial photos using minicomputers was developed.

5. Education

Photogrammetric education for geodetists and surveyors is given in Poland in the following three different levels:

- 1) high school or technical college - for Survey Technicians and/or Technologists,
- 2) post high school education of 4 years for Bachelor of Surveying (is provided only for persons who works professionally in geodesy),
- 3) university of 5 years for Master of Surveying.

The middle level of photogrammetry is provided at 28 technical high school, which teach the survey technicians.

The university education in the field of Surveying and Geodesy in Poland is provided at three technical universities and three agriculture academics. There are two Faculties of Geodesy, and at the agriculture academics: the Faculties of Geodesy and Drainage/or Agriculture Facilities). Yearly, about 300 students begin study in all above mentioned universities and academies. But only about 40 student specialize in photogrammetry and remote sensing, and only 20 students is graduated yearly. The scope of photogrammetric education is carefully adjusted to fulfil of passive and active photogrammetrists. Foreigners are educated also at the university level. We have students from some Asiatic and African countries.

The photogrammetric university staff is following: one full professor, 3 associate professors, 8 readers, 35 doctors.

Last years the following postgraduate studies were organized at the universities:

1. Engineering photogrammetry,
2. Architectural photogrammetry,
3. Remote sensing for environment protection,
4. Remote sensing in agriculture and forestry.

The study last one year, and are studies with obligatory meeting every month for a few days at the university. They serve to educate the engineers of various disciplines and have both theoretical and practical courses. For such courses guest lecturers are also invite.

The university studies in geology, cartography and geography include photogrammetry and remote sensing courses also.

6. Publications

In the period of 1976-1986 there were elaborated 10 textbooks and 1009 articles concerning photogrammetry and remote sensing.

The following are the bibliographical data for textbooks in a chronological order:

- 1) Świątkiewicz A.: Fotogrametria. Podręcznik dla studentów Geodezji i Urzędzeń Rolnych Akademii Rolniczych. PWN: Warszawa 1977, s. 329
- 2) Rudowski G.: Termowizja i jej zastosowanie. Wyd. WKŁ. W-wa

1978

- 3) Sitek Z.: Fotogrametria inżynierska. Skrypty uczelniane nr 676, wyd. AGH Kraków 1979
- 4) Świątkiewicz A.: Fotogrametria. Zasady i zastosowanie w gospodarce rolnej i wodnej. PWN Warszawa 1979 wyd. 2.
- 5) Kaczyński R.: Instrumenty stereofotogrametryczne. Skrypt WAT W-wa 1980
- 6) Sitek Z.: Fotogrametria z fotografią techniczną. PWN Warszawa 1981
- 7) Kaczyński R., Mroczek , Sanecki J.: Rozpoznanie obrazowe. MON, W-wa 1982
- 8) Świątkiewicz A.: Fotogrametria - zasady i zastosowania w gospodarce rolnej i wodnej. PWN W-wa 1983
- 9) Sitek Z.: Elementy fotogrametrii z fotografią techniczną. PWN Warszawa 1984
- 10) Beker L., Kaczyński R.: Fotorafia i fotogrametria podwodna. WNT, W-wa 1985.

The technical and scientific works were printed in 20 national periodicals, 24 serial publications and in 76 other, occasional booklets. Works prepared by polish authors were printed also in 16 publications abroad. The table below shows the thematical classification of publications according to the domains of ISPRS commissions (some papers thematically belong to more than one commission).

year of issue	ISPRS Commission number						
	I	II	III	IV	V	VI	VII
1976	9	3	5	13	8	9	31
1977	8	13	6	27	29	9	45
1978	8	14	6	19	8	33	29
1979	7	7	10	9	44	4	10
1980	10	8	10	16	11	9	32
1981	9	6	11	10	24	13	11
1982	11	4	8	15	19	14	13
1983	7	3	11	6	6	3	17
1984	18	6	29	15	16	5	48
1985	16	2	23	19	10	9	58
1986	11	3	4	6	12	3	10

Detailed information about national publications concerning photogrammetry and remote sensing can be found in the thematic bibliography which have been elaborated by our national society. First part of this bibliography was published in the proceedings of ISPRS commission VI in 1976, and the second part covering period 1976-1986 and the supplement to the first part were published by the University of Mining and Metallurgy in Cracow in 1987.

Beside the above mentioned, there are thematical bibliographies edited by "Center of professional, scientific, technical and economical information" which cover fields of geodesy (with photogrammetry and remote sensing), geography and geology.

7. Professional subjects:

Two professional organizations are active in Poland:

7.1. POLISH SOCIETY OF PHOTOGRAMMETRY AND REMOTE SENSING (PSPRS) - is the scientific section of POLISH GEODETIC ASSOCIATION (SGP). The activity of PSPRS is based on statutes of POLISH SOCIETY OF PHOTOGRAMMETRY (PSP) founded in 1930. In 1984 PSP took name PSPRS. The area of activity of PSPRS is POLISH PEOPLE'S REPUBLIC. PSPRS can be the member of other scientific associations in the country and abroad. PSPRS continues the activity of PSP which was interrupted in 1939.

The aims of PSPRS are:

- a) activity in the field of photogrammetry and remote sensing together with various technical application,
- b) popularization and promotion of photogrammetric and remote sensing methods in different scientific and technical fields,
- c) exchange publish and circulate an experiences within the country and abroad.

The supreme authority of the Society is the General Assembly. The General Assembly consist of all members of the Society, and every three years the President and by seperate voting the Council of the Society are elected.

In 1987 number of active specialists in the Society was 142.

PSPRS is a member of the Main Technical Organization in Poland (NOT - it is federation scientific, and technical associations).

Legislative basis of the professional activities of PSPRS is statutes law issued 27 October 1932 (Dz.U.R.P. Nr 94, poz.808) and amended 9 June 1982 (M.P. Nr 17, poz.144).

Main Technical Organization (NOT) and Polish Geodetic Association (SGP) have established the awards consisted a monetary grant to the author of outstanding merit also on photogrammetry, photointerpretation or remote sensing.

7.2. POLISH GEOGRAPHICAL SOCIETY (PTG) - COMMISSION OF PHOTOINTERPRETATION is active in Poland on the basic of PTG Statutes. The objective of the Commission is the activity on photointerpretation field particularly for searching geographical envirinment. The number of members of the Commission is about 70. They are members of PTG.

8. Addresses

8.1. Organizations other than education and research

1) Regional Enterprices of Geodesy and Cartography (OPGK):

15-005 BIAŁYSTOK, ul.Sienkiewicza 84; 80-952 GDAŃSK, ul.Miszewskiego 17; 40-950 KATOWICE, ul. Kosshutha 9; 31-530 KRAKÓW, ul. Grzegórzecka 10; 20-072 LUBLIN, ul.Czechowska 2; 90-746 ŁÓDŹ, ul. Zakątna 18/20; 35-959 RZESZÓW, ul. Geodetów 1; 70-508 SZCZECIN, ul.H.Pobożnego 5 53-125 WROCLAW, ul. Kasztanowa 18/20

2) City Geodetic Enterprices: KPG 30-086 KRAKÓW, ul.Halczyzna 16; ŁMPG 90-101 ŁÓDŹ, ul. Moniuszki 5; PPG 61-740 POZNAŃ, ul.Gronowa 20, WPG 00-955 WARSZAWA, Nowy Świat 2

3) Other enterprices: State Enterprise of Geodesy and Cartography - PPGK 00-950 WARSZAWA, ul. Jasna 2/4; Geoprojekt 00-895 WARSZAWA, ul. Biała 2; Mining Surveying Office Bełchaów,

PIOTRKÓW TRYBUNALSKI p.o.b. 1442; Laboratories of Preservation of Monuments (PKZ) 02-958 WARSZAWA-WILANÓW, ul. Wiertnicza 2.

8.2. Education and research

Photogrammetric Departments of Technical Universities: 30-059 KRAKÓW, Al. Mickiewicza 30; 00-661 WARSZAWA, Pl. Jedności Robotniczej 1,

Photogrammetric Departments of Agriculture Academies: 30-059 KRAKÓW, Al. Mickiewicza 24/28; 10-957 OLSZTYN-KORTOWO bl. 52; 02-975 WARSZAWA-Ursynów, ul. Nowoursynowska 166; 50-363 WROCLAW Pl. Grunwaldzki 24.

Other universities where photogrammetry and remote sensing is active are: Gdańsk University, 80-952 GDAŃSK, ul. Miszewskiego 17 Jagiellonic University, 31-044 KRAKÓW, ul. Grodzka 64; A. Mickiewicz University 61-701 POZNAŃ, ul. Fredry 10; Warsaw University - Photointerpretation Laboratory, 00-927 WARSZAWA, Krakowskie Przedmieście 30 and Photogeology 02-089 WARSZAWA, ul. Żwirki i Wigury 93; Wrocław Technical University, 54-028 WROCLAW, ul. Rajska 6.

Research Institution:

Institute of Geodesy and Cartography - Photogrammetric Department and Remote Sensing Centre (OPOLIS) 00-950 WARSZAWA, ul. Jasna 2/4; Geology Department - Polish Academy of Sciences 02-089 WARSZAWA, ul. Żwirki i Wigury 93; Geological Institute 00-975 WARSZAWA, ul. Rakowiecka 4; Stettin Institute of Technology 70-326 SZCZECIN, Al. Piastów 80.