

XIV CONGRESS  
OF THE INTERNATIONAL SOCIETY FOR PHOTOGRAMMETRY  
HAMBURG 1980

Commission VI

Working Group VI-1  
(Education and Research)

Invited Paper

ACTIVITY REPORT OF ISP WG VI-1, PERIOD 1976-80 - WORLD STATUS  
OF PHOTOGRAMMETRIC EDUCATION AND RESEARCH

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Abstract

According to the ISP Helsinki Congress resolutions the main task of ISP WG VI-1 is to continue work on the establishment of a world-wide inventory on photogrammetric education and research facilities (including remote sensing). In addition, it was recommended that ISP WG VI-1 be concerned with photogrammetry course curriculae available in developed as well as developing countries. To cope with these tasks work was distributed among the 27 members of ISP WG VI-1. The Activity Report of ISP WG VI-1, Period 1976-80, describes in more details the work achieved after the 1976 ISP Helsinki Congress up to the 1980 Hamburg Congress.

Organization of ISP WG VI-1 and Tasks of the Individual Members or Delegates of ISP WG VI-1

At the beginning of the period under review the already existing ISP WG VI-1 has been enlarged. The present members (or delegates) and their tasks are as follows:

1. Lt. Col. R.K. Aggarwala; Deputy Director, Survey of India. Task: Associate to Brig. Gen. M.M. Datta.
2. Prof. Dr. Simon Baker; East Carolina University-Greenville, U.S.A. Task: Education and Research for remote sensing applied mainly to coastal mapping, co-author of an Invited Paper on remote sensing.
3. Prof. Henri Bonneval; Ecole supérieure des Géomètres et Topographes, Paris, France. Task: Delegate for francophone countries.
4. Prof. Dr. A.J. Brandenberger; Dept. of Photogrammetry, Laval University, Québec, Canada. Task: Chairman, ISP WG VI-1.
5. Ing. Alpha Cissé; Directeur général, Institut géographique de Côte d'Ivoire. Task: Delegate for African francophone countries (in collaboration with Prof. Bonneval).
6. Chief R. Oluwole Coker; former Director, Federal Survey Division, Lagos, Nigeria. Task: Delegate for non-francophone African countries (research).

7. Brig. Gen. M.M. Datta; Senior Director, Centre for Survey Training and Map Production, Survey of India. Tasks: Vice-chairman, ISP WG VI-1, Delegate for the Asian non-francophone countries with the exception of those assigned to Prof. Nakamura, Delegate for photogrammetric education and research in developing countries, study and preparation of an Invited Paper on photogrammetric course curriculae -developing countries.
8. Dr. T.M. Erez; Deputy Director, Survey of Israel. Task: Study and preparation of an Invited Paper on photogrammetric course curriculae -developed countries.
9. Prof. Dr. Placidino Fagundes; Second Vice-president, ISP; Sociedade Brasileira de Cartografia. Task: Delegate for South-American countries.
10. Prof. Mario Fondelli; Facoltà di Ingegneria, Università di Firenze, Italy; Italian Rapporteur, Commission VI, ISP. Task: Delegate for Italy.
11. Prof. Dr. S.K. Ghosh; Dept. of Photogrammetry, Laval University, Quebec, Canada. Task: Delegate (education) for the U.S.A. and Canada
12. Dr. F.J. Hanigan; Vice-President, Aero Service Division -Western Geophysical Co. of America, Houston, Texas, U.S.A. Task: Delegate (research) for U.S.A.
13. Ing. C.T. Horsfall; Surveyor General, Survey Division, Rivers State, Nigeria; President, Nigerian Society of Photogrammetry. Task: Delegate (education) for non-francophone African countries.
14. Ing. H. Hoschtitzky; Lecturer of Photogrammetry, ITC, Enschede, Netherlands. Task: Delegate for the Benelux countries including overseas territories, Ireland and the U.K.
15. Prof. Z. Kalensky; Dept. of Photogrammetry, Laval University, Quebec, Canada. Task: Secretary of ISP WG VI-1
16. Dr. Eng. Wladyslaw Mierzwa; Scientific Worker, The Stanislaw Staszic University of Mining and Metallurgy, Kraków, Poland. Task: Delegate for East European countries.
17. Prof. Dr. Eng. H. Nakamura; Dept. of Civil Engineering, University of Tokyo, Japan. Task: Delegate for Far East countries (Hong Kong, Japan, Philippines, South Korea, Taiwan).
18. Prof. Dr. Núñez de las Cuevas; Escuela Universitaria de Ingenieros Tecnicos Topograficos, Madrid, Spain. Task: Delegate for the Iberian Peninsula (Portugal, Spain) and overseas territories.
19. Prof. Dr. E. Olson; Chairman, Remote Sensing Program, School of Natural Resources, University of Michigan, Ann Arbor, Michigan, U.S.A. Task: Study and preparation of an Invited Paper on Remote Sensing Education and Research.
20. Ing. Christian Paresi; Directeur des études pour les étudiants francophones, Dept. of Photogrammetry, I.T.C., Enschede, Netherlands. Task: Delegate for Asian francophone countries.
21. Prof. Ing. Victor Hugo Roggero; Facultad de Ingeniería, Universidad Nacional Frederico Villarreal, Lima, Peru. Task: Associate to Prof. Fagundes.
22. Dr. D. Rokos; Vice-President, Technical Chamber of Greece, Athens, Greece. Task: Delegate for Greece and Cyprus.
23. Dr. Ir. H.S. Tjokrosoewarno; President, P.T. EXSA, Bogor, Indonesia. Task: Delegate of Indonesia and Associate to Brig. Gen. Datta.
24. Prof. Dr. J.C. Trinder; Dept. of Photogrammetry, School of Surveying, University of New South Wales, Kensington, N.S.W.; Australia. Task: Delegate for Oceania.
25. Ing. J. Alberto Villasana Lyon; Director, Dirección Técnica, Dirección de Estudios del Territorio Nacional, México, D.F.; México; Presi-

- dent, Cartography Commission, Pan-American Institute of Geography and History (PAIGH), Organization of American States (OAS). Task: Delegate for México and Central America.
26. Prof. Dr. Leonid Wassiljew; Dean, Faculty of Photogrammetry, Moscow Institute of Engineers of Geodesy, Aerial Surveying and Cartography (MIIGAIK), Moscow, U.S.S.R. Task: Delegate of the U.S.S.R. -Prof. Wassiljew recently resigned as Delegate due to his transfer to a non-educational position in the Academy of Sciences of the U.S.S.R.; a replacement as Delegate of the U.S.S.R. for ISP WG VI-1 has been requested.
  27. Prof. Dr. G. Weiman; Institut für Photogrammetrie und Kartographie, Technische Universität Braunschweig, Braunschweig, Federal Republic of Germany. Task: Delegate for European German-speaking countries and Scandinavian countries.

#### ISP WG VI-1 Administration and Communication

To establish the necessary contact and communication between the members of ISP WG VI-1 and with the Presidency of ISP Commission VI, the Board of ISP WG VI-1, during the period under review, has sent 5 Newsletters to the ISP WG VI-1 members as well as to the Presidency of ISP Commission VI. In addition, the ISP WG VI-1 Board had an extensive correspondence with the ISP WG VI-1 members, the Presidency of ISP Commission VI and with the ISP Board.

Furthermore, Prof. Bonneval, Dr. S.K. Ghosh, Mr. C.T. Horsfall, Dr. W. Mierzwa and Dr. A.J. Brandenberger attended the International Symposium of ISP Commission VI on August 8-10, 1978, in Kraków, Poland. At this symposium the following papers belonging to ISP WG VI-1 were read:

- Prof. Dr. A.J. Brandenberger: "Activity Report of ISP WG VI-1, Period 1976-78".
- Brig. Gen. M.M. Datta: "Photogrammetric Education -Experiences in a Developing Country Setting".
- Prof. Dr. S.K. Ghosh: "Progress in the Photogrammetric Education and Research Survey, U.S.A.".
- Prof. I. Haidushki (Sofia): "Photogrammetric Education in the People's Republic of Bulgaria".
- Prof. Dr. L. Homorodi (Budapest): "Role of Photogrammetry in the Education of Surveyors".
- Ing. C.T. Horsfall: "Inventory of Photogrammetric Education in Africa".
- Col. G.K. Roy (India): "Problems Facing Introduction of Photogrammetric Education in Developing Countries".

At this symposium the present ISP WG VI-1 members together with representatives of the Presidency of ISP Commission VI also held a closed meeting to work out the work program of ISP WG VI-1 up to the 1980 Hamburg Congress and to prepare the ISP WG VI-1 session program for the Congress.

#### World-Wide Inventory on Photogrammetric Education and Research Facilities

Work performed during the period 1976-80 by ISP WG VI-1 for this major project of ISP WG VI-1 constitutes a continuation of the work done by ISP WG VI-1 during the period 1972-76 and on which it has been reported in:

1. "General Report of ISP Working Group VI-1; A World-Wide Analysis on Photogrammetric Education and Photogrammetric Research Policy and Organization". XIII Congress of the International Society for Photogram-

metry, Helsinki 1976, Commission VI, 1972-76, Poland, Invited Paper by Prof. Dr. A.J. Brandenberger, Laval University, Quebec, (Qué.), Canada, 6 02 033, UCD 528.74. ISP Helsinki 1976, International Archives of Photogrammetry, Reports and Invited Papers, Commissions VI and VII, Volume XXI, Part 5.

For the continuation of the project extensive use has been made of information available in the Surveying and Mapping Data Bank of the Dept. of Photogrammetry, Laval University (This data bank includes also about 100,000 addresses). Further use of the information contained in the Data Bank was made for the preparation of the following paper (which refers to the work currently undertaken by ISP WG VI-1):

2. Brandenberger, A.J.: "Education Trends in the Mapping Sciences". Proceedings of the International Symposium held October 6-8, 1976; Fawcett Center for Tomorrow, The Ohio State University, Columbus, Ohio, U.S.A., 1977.

Additional useful information sources for the work performed for the project by ISP WG VI-1 are the studies performed by and for the Cartographic Section of the United Nations in New York. Since several years such studies were performed for the Section by Laval University's Dept. of Photogrammetry (Study Coordinator: A.J. Brandenberger). Some results partially pertinent to the work of ISP WG VI-1 were published in:

3. "World Cartography, Volume XIV, United Nations. Study on the Status of World Cartography, A.J. Brandenberger". New York, U.S.A. Pages 71-96.

As a consequence of United Nations Regional Cartography Conferences' resolutions, studies on the status of the world's surveying and mapping manpower education and training situation (incl. photogrammetry) have been intensified and a special study has been commissioned to Laval University's Dept. of Photogrammetry (Study Coordinator: A.J. Brandenberger). The results of this study have been put together in a 133 manuscript pages' report which is presently in the editing process and which is to be printed in the series "World Cartography, United Nations". The title of the report is:

4. "Study on the World's Surveying and Mapping Manpower and Training Facilities" by A.J. Brandenberger.

Here, it should be emphasized that the coordination of pertinent studies conducted on the one hand by and for the Cartographic Section (Chief: Mr. C. Christopher) and by ISP WG VI-1 on the other hand has been and still is very beneficial for the work performed by ISP WG VI-1.

In order to obtain specific information pertinent to the project the Board of ISP WG VI-1 has sent to all members (delegates) a questionnaire with a timetable for the completion of the questionnaire, the compilation and the analysis of the obtained information for the various regions of the world. Specifically the questionnaire requested information on:

- A. Educational Institutions, Enrollments, Levels, Courses, Graduates
- B. Educational Institutions, Equipment
- C. Educational Institutions, Staff- Finance
- D. Organizations with Photogrammetry Research and Development (R & D) activities; Public Agencies, Private Enterprise; Equipment
- E. Organisations with Photogrammetry Research and Development

(R & D) activities; Staff-Finance.

Up to the present date the Board of ISP WG VI-1 has received regional reports or progress reports from the following ISP WG VI-1 members:

1. Prof. Dr. Simon Baker
2. Prof. Henri Bonneval
3. Ing. Alpha Cissé
4. Prof. Dr. S.K. Ghosh
5. Dr. F.J. Hanigan
6. Prof. Dr. Eng. H. Nakamura
7. Dr. D. Rokos
8. Dr. Ir. H.S. Tjokrosoewarno
9. Prof. Dr. J.C. Trinder

It is expected that additional reports will be obtained during March 1980 from other members (delegates) of ISP WG VI-1. However, due to deadline limits the information contained in these reports run the risk of not being considered in this general report. For this reason all members of ISP WG VI-1 have been encouraged by the Board of ISP WG VI-1 to report on their work in submitted Presented Papers.

#### Education and Training of Photogrammetric Personnel in Developing Countries

Due to the arrears and the urgency of Photogrammetric work in the Third World (mapping; in particular in view of a required and accelerated resource exploration operation; Reference is made to Publication 3), this problem is crucial. For this reason the Boards of ISP Commission VI and of ISP WG VI-1 have felt it necessary to devote special attention to this problem and requested Brig. Gen. M.M. Datta from India to elaborate in more details on this item in a special Invited Paper to be submitted (within ISP WG VII) to the Hamburg Congress. The same subject will also be the theme of Presented Papers (Dr. O. Fagerholm, a.o.).

#### Educational Programs in Remote Sensing

In recent years there has been a rapid development in the use of remote sensing technologies for resources exploration in general and for resources' surveying and mapping in particular. This development calls for the creation of appropriate educational programs to appropriately educate specialized personnel in these technologies. Accordingly, a respective resolution has been formulated at the 1976 ISP Helsinki Congress to appropriately include remote sensing education programs in the work program of ISP WG VI-1. Consequently, a special Invited Paper has been requested by the ISP Commission VI and ISP WG VI-1 Board to deal with this item within ISP WG VI-1 at the 1980 Hamburg Congress. Prof. Dr. E. Olson from the U.S.A. has been asked to prepare the paper; eventually in collaboration with Prof. Dr. S. Baker, also from the U.S.A.

#### Course Curriculae

Up-to-date course curriculae are essential prerequisites not only for a successful education of specialists at various educational levels (university level, technician level, auxiliary personnel level) in photogrammetry as well as in remote sensing, but also with regard to photogrammetry and remote sensing service courses to related fields (geodesy, surveying, thematic cartography, civil engineering, architecture, geology, geography, agriculture, forestry, etc.). There is a particular need for available

course curriculae to be used as guidelines for the setting up of such curriculae in developing countries; but there is also a need for improving the existing course curriculae in developed countries. For these reasons the Boards of ISP Commission VI and of ISP WG VI-1 have foreseen two Invited Papers which will deal with these items during the ISP WG VI-1 sessions at the 1980 Hamburg Congress. The following members of ISP WG VI-1 have been asked to prepare pertinent Invited Papers:

-Brig. Gen. M.M. Datta, India. -Course Curriculae -Developing Countries.

-Dr. T.M. Erez, Israel. -Course Curriculae -Developed Countries

In addition some Presented Papers are expected dealing with these items.

#### Research and Development (R & D) in Photogrammetry and Remote Sensing

There is little known on the nature and size (Manpower and annual expenditures) of the world's present R & D efforts in these fields. This equally applies to photogrammetric R & D efforts in government agencies, private enterprise and institutions of higher education. In general national photogrammetric R & D policies with specifically defined priorities and required R & D manpower & appropriations (including investments and equipment) do not exist. It is one major objective of ISP WG VI-1 to have a closer look (also from the organizational point of view) at the present status of the world's photogrammetric R & D operation. Some of the ISP WG VI-1 members have been able to collect information on the photogrammetric R & D operation in their regions, information which will be presented to the 1980 ISP Hamburg Congress as Presented Papers of ISP WG VI-1. In addition, some further consideration of the world's present photogrammetric R & D operation is presented in the last section of this report.

#### Contacts of ISP WG VI-1 with Education Commissions of Related International Organizations

According to a correspondence between Ing. J. Cruset, President, ISP; Prof. Dr. Kakkamäkki (IAG), Prof. Dr. K. Rinner (IAG); Prof. Dr. H. Matthias (FIG); Prof. Dr. Z. Sitek (ISP); Prof. F.J. Ormeling (ICA); and the Board of ISP WG VI-1 the creation of an inter-organization education commission or conference is considered. It is anticipated that such a project will be further discussed at the 1980 ISP Congress.

#### Program for the ISP WG VI-1 Sessions at the 1980 ISP Hamburg Congress

The following Invited Papers have been scheduled for the ISP WG VI-1 sessions at the 1980 ISP Hamburg Congress:

-Brandenberger, A.J.: "Activity Report, ISP WG VI-1, Period 1976-80 -World Status of Photogrammetric Education and Research".

-Datta, M.M.: "Photogrammetric Education and Course Curriculae" -Developing countries.

-Erez, T.M.: "Photogrammetric Education and Course Curriculae" -Developed countries.

-Olson, E. : "Education and Research in Remote Sensing".  
(Baker, S.)

-Sitek, Z. and Assoc.: "Photogrammetric Education for Geodesists and Land Surveyors".

-Ferschke, H.: "Photogrammetric Education for Cartographers".

In addition there will be a certain number of Presented Papers submitted to ISP WG VI-1, including the following:

- Bonneval, H.: "Photogrammetric Education and Research in Francophone countries".
- Cunietti, M.: "A Photogrammetrical Plotter designed and built for didactical purposes".
- Saibene, C.: "Yzermann, H."
- Fagerholm, P.O.: "Optimum Photogrammetric Education in Developing Nations".
- Ghosh, S.K.: "Status of Activities in Photogrammetry at Academic Institutions in the U.S.A."
- Hangan, F.L.: "Photogrammetric Research and Development in the U.S.A."
- Oshima, T.: "Photogrammetric Education in Japan".
- Szorenyi, J.A.: "Remote Sensing Research in Western Australia".
- Tjokrosoewarno, H.S.: "Photogrammetric Education and Research in Indonesia and What to be Expected in the Future".

### Some Conclusions on the World Status of Photogrammetric Education and Research

The world presently spends nearly U.S. \$1.5 billion annually for civilian photogrammetric work with a photogrammetric manpower approaching the figure 150,000. From Ref. 4 it can be concluded that this manpower consists of nearly 15,000 professional (university level or equivalent) photogrammetrists, of nearly 75,000 middle-level education personnel (technologists, technicians and equivalent), and of nearly 60,000 auxiliary personnel (photographers, plotter operators (lower level), etc.), or an education level ratio of about U:T:A=1:5:4. For photogrammetric education planning an annual intake of 1/20 of the active photogrammetric manpower is considered realistic. This means and considering the world's present photogrammetric operation the following graduate numbers are or are supposed to be produced, annually:

- Professional level: 750 (of which possibly about 5% on the Ph.D. level) or about one professional photogrammetrist per 5 million inhabitants;
- Middle level : 3,750, or about one photogrammetric technician per 1 million inhabitants
- Auxiliary Pers. level : 3,000, or about one aux. photogram. personnel per 1.2 million inhabitants

P.S.: These figures are world averages; for developed countries the figures might be considerably higher and for developing countries they might be accordingly lower.

These figures provided some indicators for the actual or supposed to be enrollment of students specializing in photogrammetry (including remote sensing for thematic mapping) at various educational levels and at pertinent educational institutions. However, it should be pointed out that actual or supposed to be enrollment in photogrammetric service courses is much bigger if one considers e.g. the world's total surveying and mapping manpower which should have at least an elementary knowledge of photogrammetry. Here, and again according to Ref. 4, we deal with a world's total surveying and mapping manpower of 1 $\frac{1}{4}$  million people and annual expenditures of about U.S. \$6 billion or about 0.1% of the world's GNP. The annual enrollment of students in photogrammetric introduction courses is further enlarged by service courses to be offered in such fields as civil engineering, architecture, geography, geology, agriculture, forestry, etc.

Annual costs for photogrammetric education is relatively high and this partially because of expensive equipment needed for the purpose. Again, and according to Ref. 4, it can be estimated that we spend on a global basis and annually an amount of in excess of U.S. \$50 million for the education of specialized photogrammetric personnel. In reality, possibly an amount of nearly twice as much is spent or is supposed to be spent if the photogrammetric service course activity is included.

The education of photogrammetric personnel in developing countries might be often considered as too costly and might require financial assistance through multilateral or bilateral assistance programs. An analogue situation exists in assisting developing countries in accelerating their national surveying and mapping operations. In view of the urgent requirements of exploring and developing natural resources in Third World countries it has been recommended in Ref. 3 that international organizations and bilateral assistance programs reserve up to 2% of their Third World financial assistance to help the developing countries in accelerating their surveying and mapping operations (this is urgently needed since less than half of the world's land area is appropriately mapped in the economically important scales). If this recommendation would be followed by subsequent actions this would also mean a corresponding increase of financial assistance to developing countries for an accelerated education and training of photogrammetric personnel.

It is recognized that the stronger a profession's education system is the stronger is the profession itself. This is reflected in a profession's organizational and administrative structure and structuring of its education system. A vigorous profession tends to reach not only a high degree of autonomy but also endeavours to provide its education system with sufficient autonomy. This trend also can be noticed in photogrammetry and or remote sensing. There now exist -at various educational levels- autonomous educational institutions both in photogrammetry and in photointerpretation-remote sensing, e.g.:

- ITC, Enschede, Netherland
- Schweizerische Schule für Photogrammetrie-Operateure, St. Gallen, Switzerland
- Internationales Zentrum für die Ausbildung von Photogrammetrie -Operateure, Stuttgart, W. Germany
- Indian Photo-Interpretation Institute, Dehra Dun, India
- Centro Interamericano de Fotointerpretacion, Bogota, Colombia

A similar development and/or trend, and this also in view of the interdisciplinarity of photogrammetry and remote sensing, can be noticed at multidisciplinary educational institutions: There are already entire faculties of photogrammetry at university-level institutions, e.g. at MIIGAIK-Moscow & NIIGAIK-Novosibirsk, U.S.S.R.; there are a number of departments of photogrammetry at various educational levels, e.g. Dept. of Photogrammetry, University of New South Wales, Australia; Dept. of Photogrammetry, Laval University, Quebec, Canada, etc. -Although there are high investment costs involved (equipment) it is expected that this trend will continue and this also and counterbalancing it in view of a high economic return factor of photogrammetric operations (it is estimated that in average photogrammetric work produces an economic saving by a factor of up to 5), which in turn would justify correspondingly high investments in the educational sector.

With regard to the organization of photogrammetric research and



development, R & D (including remote sensing and R & D work at higher level educational institutions), there exist no well established policies in most countries. In general, no attempts have not been made to determine the size and amount of human and financial resources which should be involved in these R & D operations. According to Ref. 4 the world's industrialized countries' annually spend 1.66% of the GNP for R & D. If this figure would be applied to the world's civilian photogrammetric operation (U.S. \$1.5 billion per year) this would yield annual photogrammetric R & D expenditures of approximately U.S. \$25 million of which amount a sizeable portion is support of R & D at higher level educational institutions. In view of the impact of the world's photogrammetry operation on the more and more urgent resources' exploration operations it appears that the photogrammetry R & D efforts should be rather increased to attain the figure 2% of the world's civilian annual photogrammetry expenditures. It appears that we deal here with a rather complex problem and that ISP WG VI-1 will have to devote more efforts in the future to come up with a clearer picture on the world's present and future photogrammetry R & D operations; this would also include the formulation of photogrammetric R & D policies on a national level as well as on an international level.