REPORT ON THE ACTIVITIES OF ISPRS WG V-4 (PHOTOGRAMMETRY FOR INDUSTRIAL CONSTRUCTION AND MENSURATION). 1980 - 1984.

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ABSTRACT

This report gives an overview of the achievements of ISPRS WG V-4 (Photogrammetry for Industrial Construction and Mensuration) during the inter-congress period 1980-1984.

INTRODUCTION

ISPRS WG V-4 (Photogrammetry for Industrial Construction and Mensuration) was one of four working groups of Commission 5 designated in the Resolutions of the X1V Congress in Hamburg in 1980. In June 1981 Prof K Linkwitz (Federal Republic of Germany) was appointed as Chairman of WG V-4 but due to pressure of work he resigned the chairmanship of the group in September 1982. After the inter-congress symposium of Commission V held in York, England in September 1980 Professor L P Adams (South Africa) was appointed as Chairman of WG V-4 by Dr J W Gates, the President of Commission V and charged to carry through these duties to the XV Congress in Rio de Janeiro in 1984.

FIELDS OF STUDY OF WG V-4

During discussions with working groups of Commission V at the York Symposium no individual members of WG V-4 were identified but it was agreed that the main functions of the working group for the period to the Rio Congress were:

(i) Continue study of underwater measurement technologies and water surface wave form.
(ii) Control of form and deformation of machines and large structures
(iii) Digital on-line photogrammetry
(iv) Integration into production

MEETINGS OF WG V-4

All business of ISPRS WG V/4 since the appointment of the new Chairman has been conducted by correspondence. In February 1983 a questionnaire was posted to approximately 150 addresses around the world asking for information regarding the use of photogrammetry in the engineering field in the recepient's institutions and country. Approximately 40 replies were received to this questionnaire and part of this report is based on these replies, and part on information obtained from the abstract of authors papers presented to Commission 5-4 for the Rio Congress.

Due to the mid term Chairmanship changes of WG V/4 this report must inevitably contain gaps due to a lack of information regarding the research, study and application of photogrammetry in the engineering field in a number of important centres in the world.

PARTICIPATION AT THE INTERCONGRESS SYMPOSIUM OF COMMISSION 5 IN 1982 AT YORK, ENGLAND

Two of the technical sessions at the York Symposium on precision and speed in close range photogrammetry were allocated to photogrammetry for industrial construction and mensuration. The following papers were presented and discussed at the two sessions:

SESSION 1 : Chairman I A Harley (U K)

- L P Adams (South Africa) : Underwater analytical photogrammetry using non-metric cameras.
- R A Baldwin and I Newton (U K) : A proposed system for underwater photogrammetry from a manned submersible camera platform.
- J G Fryer (Australia) : Underwater 35 mm photogrammetric applications in Australia.
- K R Holm and B Ostybe (Norway) : The Fomakon Project: photogrammetry on marine structures.
- B Szczechowski (Poland) : Photogrammetric study of the course of a ship launching.
- D J Turner and J D Leatherdale (U K) : Underwater photogrammetry for inspection and maintenance of North Sea oil platforms.

SESSION 2 : Chairman L P Adams (South Africa)

- H Anderson and D Stevens (U K) : Mono photographic tunnel profiling.
- H Schnieder and G Voss (DDR) : New instrument units of the UMK 1318 universal measuring camera system.
- D M Stirling (U K) : Measuring short term glacial fluctuation by aerial and terrestral photogrammetry - a comparative study.
- S A Veress (U S A) : Photogrammetric analysis of deformation of transmission lines.
- N A Vyner and J H Hanold (U K) : AIMS : Analytical industrial measuring systems.
- M Wahl and N Mackin (France) : Photogrammetry at the Regie Renault

REPLIES TO WG V-4 QUESTIONNAIRE AND ANALYSIS OF ABSTRACTS

Colleagues engaged in photogrammetric activities which fall within the scope of WG V/4 from many countries responded positively to the questionnaire. From the replies received and from a study of the abstracts it would seem that the West European countries are the most active in the application of

photogrammetry in industry followed by the USA and Canada but due to a lack of response from a number of notable nations it is difficult to present a full picture of present trends in respect of the application of photogrammetry for industrial construction and mensuration but it is possible to acknowledge that close range photogrammetry is now receiving well merited recognition as a precision measuring tool in the industrial field.

In the summary that follows the respondents have been listed under 3 categories : University, National Institutes and Private Consultants. Inevitably there will be a deal of overlap as, for example, University academics providing a consultant service for industry, but it is interesting to note that, although the academics continue to dominate the scene, a trend away from the University into industry itself is becoming apparent, which is a healthy sign for the future of close range photogrammetry.

SUMMARY OF ACTIVITIES

Country	No of replies	University	National Institute	Consultant	Application of close range photogrammetry
Australia	3	3			1. General underwater surveys. 2. Through water (glass bottom boat) surveys. 3. Surface deformations of solar collectors and microwave antennae for quality control. 4. Concrete dam deformations and definitions. 5. On line data acquisition for close range photogrammetry
Belgium	1	1			1. Displacement, deformation and shape analysis by holography, speckle and moiré. 2. Microdeformations of concrete.
Brasil	1	1			1. Monitoring deformations of concrete.
Canada	3	1	1	1	1. Control of form and deformation of large structures and microwave dishes. 2. Use in mining, civil and geotechni-

Canada (contd)					cal engineering. 3. Monitoring of deformations of exposed concrete panels on buildings subject to extreme temperature variations. 4. Aerospace - quality control, deformation control for robotics, monitoring alignment. 5. Mechanical/Civil Engineering - deformation of radar antennae, buildings, bridges, dams, utility towers, mechanical components. 6. Mining and geotechnical engineering - design of industrial measurement equipment. 7. Measurement of ultra sonic imagery.
Denmark	2	2			1. Establishing the keeling angle of a vessel. 2. Survey of drilling platform under construction.
Federal Republic of Germany	5	4		1	1. Deformation surveys of ground slopes, ground subsidence. 2. Deformation survey of large scale excavator. 3. Underwater photogrammetry. 4. Soil model studies. 5. Precise length calibration. 6. Bridge deformations. 7. Survey of cooling towers.
France	3		2	1	1. Nuclear inspection. 2. Underwater photogrammetry using metric cameras. 3. Displacement survey of large bridge structures.
Indonesia	4	4			1. D T M for civil engineering purposes. 2. Dam deformation studies. 3. Surface wave form for dyke construction. 4. Traffic analysis.

Japan	1	1			1. Measurement of large objects such as air domes, spherical tanks, underground tunnels. 2. Measurement of medium objects such as gas pipes and vehicles. 3. Measurement of small objects such as teeth, screws. 4. Measurement of microscopic objects (photomicrograph, X rays, electron microscopy). 5. Deformation of ship launching ways.
Israel	3	3			1. Calibration of oil storage facilities. 2. Deformation of structures and buildings. 3. Deformation of underground structures. 4. Deformation analysis of high chimneys.
Norway	1	1			1. Marine structures (ships and offshore structures).
Poland	2	1	1		1. Ship deformation. 2. Ship launching. 3. Model harbour wave form studies. 4. Underwater measurement of ship wrecks. 5. Shapes of antennae, prefabricated panels, ship segments. 6. Deformation and displacement of cranes under load, industrial halls, bending of power line pillars under load bridges. 7. Dynamic processes - amplitude of bridge vibrations, explosions.
South Africa	3	2	1		1. Model harbour studies and wave forms. 2. Underwater photogrammetry in marine biological studies. 3. Deformation of microwave antennae. 4. Deformation of rubber cylinders.
Sweden	1			1	1. Sub sea photogrammetry systems. 2. Off shore surveys.

Switzer-land	1		1		1. Evaluation of industrial measure-ment systems.
United Kingdom	16	6	3	7	1. Underwater photogrammetry in North Sea for oil and gas industry 2. Survey of oil rigs above and below surface. 3. Building elevations and bridge structures. 4. Process plants. 5. Tunnel measurements. 6. Photogrammetry in design of pipes. 7. Monitoring movement of structures. 8. Glacier movement. 9. Slope stability surveys. 10. Monitoring bridges. 11. Mapping of pipe positions. 12. Deformation of models in civil engi-neering laboratories. 13. Video photogrammetry in underwater surveys and robotic operations. 14. Body movement at work, sport and in medical applications. 15. Micro relief surveys of sea bed. 16. Growth rate of coral. 17. Deformation of concrete bridges. 18. Flow in hydraulic machinery. 19. Underwater systems for marine biology. 20. Study of robotics. 21. Volumes in open cast mines. 22. Survey of impellers. 23. Deformation of cranes under load. 24. Thermal distortion of car gearbox casings. 25. Finite element model verification of lorry cabs. 26. Strain measurements on pipe whip experiments. 27. Automatic plate measurements. 28. Deformation measurements of large structures using moiré photography. 29. Photogrammetry in aircraft industry.

U S A	4	1	1	2	1. Electric transmission lines and steel girder bridge testing using video equipment and 70 mm photographs. 2. Photogrammetric technology in aircraft manufacturing. 3. Photogrammetric technology in ship building and ship deformation. 4. Survey of pipeworks. 5. Prelaunch surveys on Space Shuttle Columbia. 6. Test chamber surveys of structures to be deployed in space

PHOTOGRAMMETRY FOR INDUSTRIAL CONSTRUCTION AND MENSURATION - OVERVIEW OF ACHIEVEMENTS FOR THE PERIOD 1980 - 1984

It is clear from a study of the summary of activities and from the increasing number of articles, dealing with the use of photogrammetry in industry, appearing in engineering and like journals that the application of photogrammetry in the industrial field has developed well beyond the applied research experimental stage and that it is also beginning to be used as an everyday recording and measuring tool. It is encouraging to find that a number of informed national engineering laboratories and institutes have established photogrammetric sections within their organisations manned and supplied with the necessary expertise and photogrammetric equipment to provide a much needed but novel mensuration service.

It is also extremely encouraging to note that a few enterprising colleagues have established private photogrammetric consultant firms concerned exclusively or partly with the application of close range photogrammetry in engineering and allied fields.

The academic photogrammetrist located in universities and technicons throughout the world continues to undertake research (mainly of an applied nature) in the use of close range photogrammetry in the industrial field, as witnessed by the increasing number of technical articles appearing in photogrammetric journals and concerned with industrial application.

Again, from a study of the summary of activities we can recognise the following trends:

(a) The maritime nations have clearly accepted the possibilities of photogrammetry as a measuring tool not only underwater and on the surface in a hostile marine environment but also as a ship building and model harbour design aid. It is anticipated that studies in the use of close range photogrammetry in the marine environment will continue to play a dominant part

in the activities of WG V/4 (or its successor) during the 1984-1988 Inter Congress period.

(b) The application of close range photogrammetry in quality control and deformation studies particularly in the Mechanical and Civil Engineering disciplines has played an important part in the activities of members of WG V/4 during this reporting period, and it is expected that these activities will increase as the engineering organisations become more aware of the measuring power of the photograph and of photogrammetry.

(c) Much progress has been achieved in the application of digital on-line photogrammetry, and the use of video photogrammetry for example in industry makes the introduction of real time systems into WG V/4 activities possible.

(d) Steady progress has been made in the integration of photogrammetry as a measuring tool in the industrial process particularly in national engineering and allied institutes and laboratories.

(e) There is a definite indication that photogrammetry is starting to play an important role in the aircraft and space industry and this aspect of the Working Group's study function will become increasingly important in the future.