

## **FIG Commission 6 – Engineering Surveys**

### **Annual Report of Activities 2012**

#### **General**

Commission 6's work plan for 2011-2014 consists of 4 main mission statements, namely:

- promote the knowledge, skills and abilities of surveyors in civil and industrial works within the various professional fields of engineering
- support all development and multidisciplinary expertise leading to integrated survey methods, using various instruments (geodetic, geotechnic, fast motion) and sensors and combining geometry with all other data relevant to each engineering problem
- provide a forum for exchange of knowledge related to engineering analysis of survey data for the study of structures
- in addition to the links with related WGs of IAG, ISM and ISPRS, look for possible cooperation within these organisations and support the co-operation of civil, structural and mechanical engineers with our profession

During 2012, commission 6 was active within the FIG Working Week in Rome, participating in 15 technical sessions, Working Group 6.2's organised "First International FIG Workshop on Monitoring High Rise and Tall Engineering Structures Development and Practices" in Hong Kong, and involvement, participation and support of a further 5 international meetings in Novosibirsk, Beijing, Hangzhou and Uruguay. Commission 6 is sub-divided into three working groups and a fourth jointly with commission 5:

#### **Working Group 6.1 – Deformation Measurements and Analysis**

Chair: Prof Wolfgang Niemeier.

#### **Policy Issues**

Deformation studies in Engineering Surveying are based on a broad knowledge of suitable sensors and their potential, modern data storage and communication solutions and advanced processing and analysis methods. Additionally a thorough understanding of the behaviour of monitoring objects (large scale structure or landslide effected area), is essential to set-up and operate an optimum monitoring system. Nowadays deformation tasks are more and more oriented towards real-time systems, which require automation of data capture and new concepts in data processing, analysis and interpretation.

## **Working Group 6.2 – Engineering Surveys for Construction Works and Structural Engineering**

Chair: Joel VanCranenbroeck

### **Policy Issues**

- Promoting the use of adapted survey techniques in industry & engineering;
- Promoting a multidisciplinary collaboration between survey engineers, civil engineers, structural & mechanical engineers;
- Promoting the use of adapted survey techniques in the rail and railway building and operating sector;
- Promoting the understanding of fibre optic sensors, e.g. interferometric sensors, Brillouin and Raman scattering and Bragg gratings;
- Study the use of embedded sensor arrays and the role of advanced surveying techniques for structural monitoring;
- Creating an awareness of surveyors through a task force "Fibre optic sensors" of the rapidly emerging technology of fibre optic sensors as "non-geodetic" sensors to measure deformations (strain) and temperatures in civil engineering structures
- Promoting the use of Terrestrial based RF positioning system in engineering surveying;
- Creating an awareness of surveyors through a task force "Geotechnical sensors" as the trend today is going for an integration of those sensors in the geodetic deformation analysis.
- Creating an awareness of surveyors through a task force "Railways Trolley monitoring system.

## **Working Group 6.3 – Machine Control and Guidance (MCG)**

Chair: Henrik Vad Jensen

### **Policy Issues**

The importance of real-time 3D-position sensors for navigation of machinery on construction sites of roads, tunnels, railways, and airports has increased over the last years and the market is still growing. Also in the field of agriculture GPS-based applications such as crop mapping and automatic steering are well introduced. The new FIG Working Group 6.5 will intensively deal with following topics:

- Kinematic Measurement and Sensor Technology (focus on L1 RTK Low-cost systems, adjustments of total station MCG requirements,

additional Sensor like Slope Sensors, INS, Orientations Sensors, etc.),

- 3D-Applications (Agriculture, Construction, Special Applications e.g. UAVs),
- Multi-Sensor Systems and -platforms
- MCG Data Processing and Data Flow
- Control Process and Control Algorithm
- Standardization of Major Construction Projects
- The main goal of Working Group 6.3 is the interaction of research and industry activities.

## **Activities in 2012**

### **FIG Working Week**

Commission 6 participated in the FIG Working Week in Rome, May 2012 in 15 technical sessions, presenting 84 papers. A personal report from Gethin Roberts is attached to this paper, this was presented in the Chartered Institution of Civil Engineering Surveyors' Journal.

### **Geosiberia**

Commission 6 supported this event, and was attended by Ivo Milev. The event brings together surveyors from inside and outside of Russia and is growing every year to be an international conference.

### **Kazakhstan**

A joint commission 5 and 6 meeting was held in Kazakhstan in September 2012. The Workshop was entitled "Innovative Technologies for an Efficient Geospatial Management of Earth Resources" organized by the International Federation of Surveyors (FIG), Kazakh National Technical University after K.I. Satpaev (KazNTU) and Siberian State Academy of Geodesy (SSGA). The workshop was held in Almaty, Kazakhstan.

### **Hong Kong**

The First International FIG Workshop on High Rise and Tall Engineering Structures: Development and Practices, 22 - 23 November 2012, was held at The Hong Kong Polytechnic University. This was organised by Working Group 6.2.

### **Beijing, China**

Prof Roberts was invited to give a key note talk at the RICS Annual General Meeting and Conference Fit for the Future Conference in March 2012.

## **Hangzhou, China**

Prof Roberts was invited to attend the Hangzhou Forum on UN-GGIM & PCGIAP EB Meeting, May 2012. This was a UN meeting, attended by many senior surveying heads from around the World.

## **Wuhan, China**

Prof Roberts as invited to give a key note talk at the RICS International Geomatics Conference in December 2012.

## **FIG Regional Conference, Uruguay**

Commission 6 had representation and were involved with technical sessions at this event.

Further information about the details of these meetings can be found on the FIG's web page.

## **2013**

Three main events will be the focus of Commission 6's activities in 2013:

- FIG Working Week, Abuja, Nigeria.
- Working Group 6.1's workshop on Deformation Monitoring, Nottingham, UK.
- Commission 6 and Young Surveyors Conference in Ningbo, China September 2013.

Further information on Commission 6's activities and contacts can be found on the Commission 6 web page, and most of the conference proceedings can also be found on the FIG's web page.

[www.fig.net/commission6](http://www.fig.net/commission6)

## **Professor Gethin Wyn Roberts FCInstCES**

### **Chair of Commission 6**

February 2013

## **FIG Working Week 2012, Rome, Italy**

Prof Gethin Wyn Roberts, FIG UK Commission 6 Delegate and Chairman of Commission 6 “Engineering Surveys”, The University of Nottingham Ningbo China

Dr Lawrence Lau, Commission 6 Vice Chair for Administration, The University of Nottingham Ningbo China

Dr Craig Hancock, Commission 6 Vice Chair for Administration, The University of Nottingham UK.

The 35<sup>th</sup> FIG Working Week took place in Rome from the 5 – 10 May 2012. The event was hosted by Consiglio Nazionale Geometri e Geometri Laureati, CNGeGL, and over 1,300 delegates attended, including an incredible 150 young surveyors from 40 different countries.

### **FIG Young Surveyors**

The Young Surveyors (YS) Network held their own pre-conference on the 3 – 4 May. 32 papers were presented by the YS, covering the following areas:

- Challenges for Young Professionals
- Young Surveying Professionals
- GIS and Land Management
- Surveying and Measurement
- Real Estate and Property
- Forum Discussion on Young Surveyors Role and Challenges in the Current Society
- Plenary Session - Young Surveyors as Agents of Change
- Plenary Session - GLTN and Youth Dimensions (co-organised by UN HABITAT)

### **FIG/IAG Workshop**

Running in parallel to this, commissions 5 and 6 held a workshop jointly with the International Association of Geodesy (IAG) focussing on “Reference Frames in Practice”. Some 40 delegates attended this event and the following topics were presented:

- The Role of Geodesy
- GGOS and Future Trends
- Global Terrestrial Reference Systems and Frames
- Regional and National reference systems
- IGS services and other initiatives
- Four dimensional deformation models for Terrestrial Reference Frames
- Gravity and WHS
- Worked examples of Terrestrial Reference Frame realisations

- Multi GNSS Environment
- Standards and Traceability of a Terrestrial Reference Frames / GNSS

### **ACCO Meeting**

On the 4<sup>th</sup> May, there was a daylong meeting of the Advisory Committee of Commission Officers (ACCO) where discussion and decisions were made with regards technical sessions at future FIG events, procedures involved, as well as commission specific events.

### **General Assembly**

The working week itself started off with the General Assembly during the whole of Sunday; where various member organisations, including the ICES, vote on various FIG issues. These included membership applications from new organisations. The University of Nottingham Ningbo China (UNNC) successfully applied for academic membership, The University of Nottingham UK is already a member. This illustrates the increasing surveying activities on the two campuses, including the introduction of the MSc course in Engineering Surveying and Geodesy at UNNC. The full proceedings, agenda and minutes of the General Assembly can be found at the FIG's web page.

### **Technical Sessions**

During Monday to Wednesday the technical sessions at the FIG were held. Commission 6 organised and co-organised the following sessions that included some 84 papers:

TS01F - Dam and Reservoir Engineering Surveying  
 TS01L - Mining and Underground Engineering Surveying I  
 TS02F - Engineering Surveying – Photogrammetry  
 TS03F - Deformation Monitoring I  
 TS04F - Deformation Monitoring II  
 TS05J - Mining and Underground Engineering Surveying II  
 TS06G - Engineering Surveying, Machine Control and Guidance  
 TS07A - Laser Scanners I  
 TS07M - Remote Sensing Applications and Case Studies  
 TS08C - Laser Scanners II  
 TS09D - Laser Scanners III  
 TS09I - Engineering Surveying  
 TS05H - Remote Sensing I  
 TS06I - Remote Sensing II  
 TS08B - The Impact of Earthquakes and Geodynamics on Geodetic Reference Frames

These sessions were very well attended, with standing room only at a couple of the sessions, illustrating the interest in this subject area. One area in particular that has shown a lot of interest this year is that of the subject of laser scanners. Commission 6 has a joint Study Group 6.2.2 Laser Scanners (Joint with Commission 5). This is chaired by Dr Ivo Milev, Bulgaria, who was also voted in as the new Commission 6 chair from 2014. The interest in laser scanners illustrates the impact this device is having on surveying, and how it has become part of the surveyor's armoury over the past 10 to 15 years. Another new device that has emerged over the past handful of years is Ground Based Synthetic Aperture Radar (GBSAR). This is a tripod mounted SAR system.

I can remember when I first saw a laser scanner, on display at the World of Surveying when it was held at Castle Donnington some 10 or so years ago. There was a lot of interest and scepticism of this strange device, that looked a little like a Geodimeter EDM, and only a relatively short time later some such devices are as small and light as a total station, able to record data at a phenomenally high data rate, with a resolution close to that of total stations. The applications of these devices are ever increasing.

Various plenary sessions were held during the working week, including the following:

- Knowledge to Manage
- Knowledge to Protect
- Knowledge to Evaluate

All the papers and presentations will be available on the FIG's web page [www.fig.net](http://www.fig.net).

### **Commission 6's Work**

Commission 6 has been very busy over the past year or so. Various sessions were organised at both the Rome working week, as illustrated earlier, as well as the working week in Morocco in May 2011. Various jointly organised events were held, notably GeoSiberia in Novosibirsk in April 2011 and 2012, a surveying conference focussing on "Innovative Technologies for an Efficient Geospatial Management of Earth" in Ulaanbaatar Outer Mongolia in September 2011, and the same conference is planned in Kazakhstan for September 2012. A conference focussing on surveying high rise buildings is planned for the 22 - 23 November 2012, and the 8<sup>th</sup> FIG regional meeting is to be held in Uruguay 26 – 29 November 2012.

These conferences are held in regions and parts of the World where there are increasing opportunities. An internationally focussed surveyor can take advantages of these opportunities, and such events can allow the right connections to be made.

### **UNNC Paper**

This year I gave a presentation about the University of Nottingham's Campus in China, where I am the Dean of the Faculty of Science and Engineering, and our activities; in particular the start of the MSc course in Engineering Surveying and Geodesy here from September 2012.

The overview of the campus is that we have approximately 5,200 students, and expanding to 8,000 over the next few years. There are a variety of subject areas, including business, international studies, international communications, education, as well as science and engineering. Science and Engineering is relatively new on the campus. All the courses are delivered in English, and follow the same learning outcomes as the courses in the UK and Malaysia campuses. All the quality assurance is carried out in the UK, with the same external examiner. All the students receive a University of Nottingham degree certificate once they graduate.

We plan to expand our non Chinese student numbers to 20% and our postgraduate numbers to 15-20% of the planned 8,000 overall student number. The advantage is that students can obtain a UK based education, but also live in China; hence learning more about the culture as well as the language through our complimentary Mandarin classes.

Due to the expansion, the faculty is currently recruiting a further 39 academic staff from all over the world to join the current 38. This gives academics the opportunity to work in a new facility, supported by the University of Nottingham's pedigree. The University, with support from the local and national Chinese governments, are investing in the infrastructure required for the expansion, as well as equipment and facilities. It is truly an incredible place to live and work, and the pace of expansion is incredible.

The enigma that China appears to be to most people is in reality an easy place to work and live in. The most difficult thing was that first step in taking the plunge and coming out here.

Moreover, two technical papers were presented in TS05B - GNSS CORS Infrastructure and Applications I and TS08C – Laser Scanners II by the Commission Vice Chairs. Lawrence gave insights on the effect of GNSS modernisation on surveying, especially on multipath effect. Craig ..

### **FIG Activities**

The University of Nottingham Ningbo China became an academic member of the FIG at the working week.

Future FIG events include the following:

26 – 28 September 2012, Commission 2 “Professional Education” conference on “Global trends and convergence in Surveying Education”, Moscow.

22-23 November 2012, Commission 6 workshop on “Monitoring High Rise and Tall Engineering Structures”, Hong Kong.

26-29 November 2012, FIG Regional Conference in Uruguay.

During the FIG working week at Rome, various elections for FIG officers were made. The following were voted in to start as commission chairs in January 2014:

Dr Pengfei Cheng (China PR) and Mr Bruno Razza (Italy) were elected as the next Vice Presidents of FIG for term 2013-16.

The Commission Chairs Elect for 2013-14 are –

Commission 1: Mr. Brian Coutts (New Zealand)

Commission 2: Ms. Liza Groenendijk (Netherlands)

Commission 3: Mr. Enrico Rispoli (Italy)

Commission 4: Ms. Angela Kesiena (Nigeria)

Commission 5: Prof. Volker Schwieger (Germany)



Commission 6: Dr Ivo Milev (Bulgaria)

Commission 7: Ms Gerda Schennach (Austria)

Commission 8: Mr Kwame Tenadu (Ghana)

Commission 9: Prof Liao Jinping (China PR)

These people will become chairs from January 2014. In addition to this, the venues for the 2015 and 2016 working weeks were decided upon as:

FIG Working Week 2015 will be in Sofia, Bulgaria

FIG Working Week 2016 will be in Christchurch, New Zealand

### **Final Words**

The FIG working week was an excellent event, and allowed networking as well as learning about new concepts and applications. The World is becoming increasingly smaller and the opportunities for UK surveyors overseas is increasing.



Gethin with President CheeHai Teo



Gethin and President Jason Smith, President ICES



Gethin with Vice President Rudolf Staiger and Kate Fairlie (chair of the FIG Young Surveyors' Network)



Gethin Receiving the Certificate of Academic Membership for the University of Nottingham Ningbo China.



A who's who of FIG and IAG.



It was very hot in Rome.



Lots of Deformation Monitoring in such a Historic City.



More monitoring



Gethin, Alan Wright, Ahmed Chiki and daughter Neila Chiki from Algeria