



International Federation of Surveyors  
Fédération Internationale des Géomètres  
Internationale Vereinigung der Vermessungsingenieure

## Commission 5

Positioning and Measurement (2007-2010)

[www.fig.net/figtree/commission5](http://www.fig.net/figtree/commission5)

# *FIG 2008 Working Week Report Stockholm - Sweden*



## INTRODUCTION

In this FIG Commission 5 Report we will provide a review on all interesting activities at the FIG Working Week 2008 in Stockholm.

## GENERAL ASSEMBLY

The Working attracted almost 1000 delegates from 95 different countries and nations. Two (2) General Assemblies were held on the 15 and 19 June 2008 at the Stockholm City Conference Centre - Norra Latin, Stockholm - Sweden. There were at least 52 Member Associations

representing various countries at both meetings.

From a FIG Commission 5 perspective the highlight was the selection of Mr Mikael Lilje (SLF, Sweden) to the Chair Elect position.

Mikael will be in this position for the term of office 1 January 2009 to 31 December 2010 and will then be elected as Chair of Commission 5 for the term of office 1 January 2011 to 31 December 2014. Congratulations to Mikael, a well deserved and supported appointment!



Mr Mikael Lilje

Other highlights were -

- The General Assembly admitted the Geodetic Engineers of the Philippines, Inc. and the Chamber of Graduate Surveyors from Bulgaria to become member associations of FIG; and

endorsed several national organisations as new affiliate members.



- Dr Diane Dumashie replaced Mr Simon Adcock as the Chair of Commission 8
- Update reports on the progress of work from Commissions, Task Forces, ACCO, FIG Liaisons and various FIG projects.
- Election of Mr. Iain Greenway, RICS, United Kingdom and Mr. Teo CheeHai, PEJUTA, Malaysia as the next FIG Vice Presidents for the term 2009-2012.
- The restructuring of FIG Publications to four categories: FIG Policy Statements; FIG Guides; FIG Reports; and FIG Regulations.
- An increase in FIG subscriptions for 2010
- Reports from organisers for the following events -
  1. Joint FIG / World Bank high level symposium in WASHINGTON DC, USA in March 2009
  2. FIG Working Week 2009 in EILAT ISRAEL, 3-8 May 2009
  3. 7th FIG Regional Conference in HANOI, VIETNAM, 19-22 October 2009
  4. FIG Congress 2010 in SYDNEY, AUSTRALIA, 11-16 April 2010



## PRECIS OF TECHNICAL SESSIONS

Overall there were 70 technical sessions with almost 350 presentations at the Stockholm 2008 Working Week. At this symposium FIG Commission 5 was once again very popular and thus busy as it attracted and facilitated 83 related technical papers and posters. There was also a Plenary Session for the technical FIG Commissions. At this session, "Technical and Organisational Innovations", delegates heard interesting and thought provoking speeches from Mr David Zilkoski the Director of NOAA - NGS, Mr Frank Udnæs from the Galileo Unit of the European Commission and Stig Jönsson, Director General of Lantmäteriet (National Land Survey of Sweden).

For the first time in FIG history a Peer Review System was implemented for the Technical Papers. Nine (9) FIG Commission 5 papers out of 65 were peer reviewed. In summary - 42 were accepted ; all papers were blind reviewed twice ; 79 reviewers participated ; and paper quality was generally good. Some 'positive' processing changes will need to be implemented to the FIG Peer Review System before the next Working Week in Eilat.

The following is a summary of the majority of Commission 5 technical sessions. To view most of these papers, presentations and

posters from the Stockholm Working Week please navigate to the web site - <http://www.fig.net/pub/fig2008/techprog.htm>

- TS 1C - Development in GNSS Measurement Technologies and Techniques

This technical session examined the accuracy and reliability of new positioning technologies such as 'high sensitivity' GPS receivers, the use of GPS RTK for car accident avoidance systems, "MEMS" and GPS for mobile mapping techniques. A paper on future trends of surveying was also presented. Overall this session highlighted the various 'tiers' of positioning infrastructure and associated applications, which are evolving from GNSS CORS networks.

Peer-reviewed papers 2959 and 2811 are recommended reading.



- TS 1H - Developments in Scanner and Sensor Technologies

Three papers were presented. The first paper was presented by Prof. Charalabos Ioannidis. It dealt with compatibility issues between the integrated use of optical and radar (SAR -space born radar systems) data.

The main interest in using the combined data is that there is more data and better results in principle. However, there remain some drawbacks, notably cost. The second paper was presented by Mr. Jens-André Paffenholz. This fascinating paper discussed the problem of geo-referencing terrestrial laser scanner using kinematic GNSS. Precisions in the order of 1 cm per 30 m were achieved. The third paper presented by Mr. Johannes Böer concerned the new TanDEM-X (TerraSAR-X Add-on for Digital Elevation Measurements) space born Earth observation mission. It is based on two synthetic aperture radar (SAR) satellites operating in close helix formation as a single-pass interferometer. This flexible system will produce very high precision elevation measurements. All three papers were of excellent quality.



- TS 1I - Imaging Data Applications.

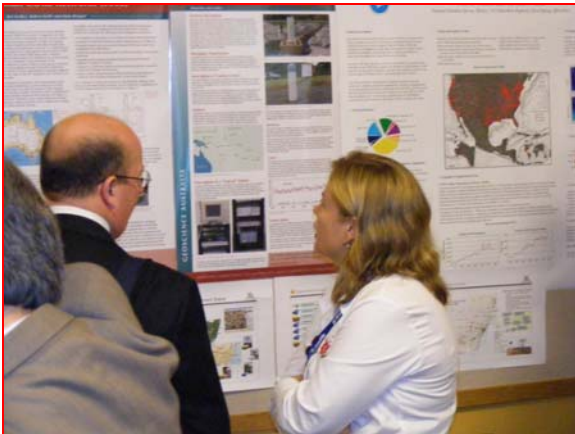
This technical session provided information on-

1. The error budgets of all the contributing sensors used to produce high precision 3D models from LiDAR and digital imagery.
2. The use of a simple digital camera and photogrammetric techniques, including an iterative curve-fitting

algorithm, to determine erosion of agricultural land in Israel. This technique was designed for data collection from non-skilled users and it was quite innovative.

3. A more traditional use of 50 terrestrial photos, stitched together with control points to reconstruct a 3D digital model of the Kizil Killise (Red Church) in Turkey.
4. The evolution of laser scanning technology and showcased some of the cutting edge techniques with various applications.

Paper 3047 is recommended reading.



- TS 2A - Geodetic Networks, Reference Frames and Systems I

Overall this was a 'great' technical session to promote the scientific 'value' of geodesy. Papers and presentations were linked and relevant to demonstrate (a) the importance of global (ie GGOS) and regional geodetic observing systems (ie NGOS) and associated infrastructure, (b) how various organisations have implemented the 'results' of geodesy ie reference frames, transformations etc to perform their core business. Examples of implementation ranged from crustal

monitoring to re-adjustment of geodetic and cadastral networks.

Papers and presentations 2992, 2729 and 2890 are recommended reading.

- TS 2D - Calibration of Instruments

This session provided a valuable input for FIG Commission 5 Working Group 5.1, especially the technical papers by Mechelke et al. (2785) and Gottwald (2740) as both examined terrestrial laser scanners. Papers on length / angle standards, calibration procedures as well as calibration of digital levels were also presented. Although the last paper did not blend with the overall them of this session the application and comparison of photogrammetry and laser scanning was interesting.

- TS 3A - Geodetic Networks, Reference Frames and Systems II

In this session, two papers from Brazil and Sweden described how to transform old geodetic information to a more modern reference system. Both experienced similar problems but had slightly different approaches to resolve them and achieved the same outcome. In concluding, there is no "the best way" as the approaches used were mainly based on history and tradition.



Dr Craig Roberts

- TS 3D - GNSS Reference Stations

The session focussed on special topics within the general theme GNSS CORS that are dealt with in FIG Commission 5 Working Groups 5.2 and 5.4. The four presentations gave important contributions to real time networks showing a thematic priority on quality issues especially integrity. The web-interface as a technical realisation for RTK monitoring was emphasised as an important issue as well.



- TS 3H - Reliability of Positioning and Measurement Technology

Four papers were presented. The first paper was presented by Mr. Hannu Koivula. It studied the interdependence on GNSS accuracy and baseline lengths and session lengths. It produced some very interesting and concrete results in response to the question: what do we know about accuracy of GNSS? The second paper presented by Dr. Jiri Lechner presented different aspects metrological traceability related to geodetic surveying tasks in the Czech Republic. The third paper was presented by Dr. D. Ugur Sanli. It concerned the accuracy of GNSS positioning with large height differences. The final paper was presented by Dr. Mohamed Ettaid. It

must be noted the he was not one of the authors of the paper which concerned models of the quality of GNSS planimetric positioning. It was closely related to the first paper developing a series of models relating quality to baseline length and session duration.



Mr David Martin

- TS 4C - GNSS Standards

The main concepts for consideration that came from this session were -

1. TC 172/ Part 8 about calibration and testing of GNSS has been published.
2. It is important that FIG Commission 5 continue to present existing standards on this topic and they should also encourage publications and presentations on how to use them in practice. However an obstacle to this is the cost, accessibility and possible copyright issues associated with the ISO standards.
3. FIG Commission 5 need to explore facilitating the development of guidelines on real time positioning.

Paper 2973 is recommended reading.

- TS 4G - Processing of Geodetic Data

This session gave insights into deformation analysis using strain parameters, influence of global ionospheric models on GPS static positioning as well as the evaluation of Quick Bird images in combination with low-cost GPS. The talks were given predominantly by young scientists presenting their first papers at international conferences with encouraging success.



Dr Volker Schwieger

- TS 5F - Geoid

This technical session had several papers, which discussed and examined the results from the various techniques used to determine or improve a geoid model for their survey application or location. There was also an interesting paper and presentation that articulated an organisation's experiences when using absolute and relative gravity instruments for the determination of a post glacial rebound model for the Nordic area. Unfortunately, presenters for 2 papers did not show up for this technical session.

Papers and presentations 2876 and 2720 are recommended reading.

- TS 5G - GNSS Antenna Calibration and Accuracy Assessment

This session was jointly designed by the chairs of Working Groups 5.1 and 5.4. It provided an overview with respect to antenna calibration in absolute and relative mode. The first paper given by Zeimetz and Kuhlmann (2901) summarized recent investigations regarding absolute calibration in an anechoic chamber. The second paper by Weston and Mader (2857) presented the calibration procedure of the National Geodetic Survey of the USA to the participants. The session was complemented by investigative papers outlining the influence of multipath on GPS positioning.

- TS 6F - Posters Associated with Discussion Forum in TS 7F on Real Time GNSS CORS

This poster session provided GNSS CORS operators the opportunity to present an overview of their networks and the issues that they are currently experiencing. 13 'flash or quick' presentations were delivered from various organisations around the world, with a majority of these located in Asia Pacific Region. The issues that arose from the forum were -

1. What is the role of FIG concerning the following?
  - Standards / guidelines for station infrastructure, and coordinate integrity and quality? This includes densification, monumentation and CORS classification issues ie IGS versus position infrastructure quality.
  - standards, models and protocols for base station data management and distribution?

- data exchange formats - e.g. compatibility between RTK systems
  - various service and data management model that could be used? Business and Pricing models? Agreements? Liability and Risk?
  - the role, function and responsibility of stakeholders.
  - finding and justifying financial resources for the expansion / densification / maintenance of CORS? That is, development of business cases?
  - finding skilled human resources to manage the network.
  - overcoming IT, server architecture and communication problems
  - keeping CORS infrastructure up to date with GNSS modernisation and new hardware / software / techniques / RTCM
  - management of CORS networks with respect tectonic plate movements, distortions in the terrestrial networks, adjoining CORS networks, and vertical datums.
2. How can FIG encourage the development and provide best practice guidelines, surveying methodologies, field operations for RTK CORS users and providers?
  3. Facilitate representation for RTK CORS providers/users to lobby their wants/needs to GNSS owners, telecommunication agencies, GNSS equipment and software manufacturers / suppliers, IGS.

From a FIG Commission 5 administrative perspective, the poster session was a great success with respect to content, attendance and mode of presentation.



Dr Sandra Verhagen

To assist presenters to prepare for this forum a template of the poster content was provided. All posters were affixed to the walls of the technical session room. Each of the 13 posters were introduced by the authors via quick power point presentations. This enabled delegates to easily identify the authors during the discussion and question period, which succeeded the oral presentations. This session attracted well over 100 delegates and set the platform for very interesting discussions for the remainder of the day. As a result, it is highly likely that posters sessions of this kind will be employed by FIG Commission 5 at future events and a proposal for 'poster presentations' is now being considered by ACCO.

All posters and presentations are recommended reading.

- TS 7F - Discussion Forum on Real Time GNSS CORS (Related to Special Poster Session TS 6F)

The purpose of this session was to discuss and review the issues raised during the TS 6F Session. It was an open forum to all Real Time GNSS CORS users and providers. A power

point presentation by Mr Mikael Lilje (FIG Commission 5 Vice Chair) and Dr Sandra Verhagen (IAG Commission 4, President) to entice and facilitate discussion was prepared and can be found at web location [http://www.fig.net/pub/fig2008/ppt/ts07f/ts07f\\_01\\_lilje\\_ppt\\_3165.pdf](http://www.fig.net/pub/fig2008/ppt/ts07f/ts07f_01_lilje_ppt_3165.pdf).

There was active participation from nearly 100 delegates and quality responses to resolve the issues were received. The session was 'masterfully' chaired by Prof. Chris Rizos (Vice President IAG) and Prof. Rudolf Staiger (FIG Commission 5 Chair)



The results of the discussions were for FIG Commission 5 to -

1. Use and upgrade the existing FIG Commission 5 webpage as a portal for information. That is source material and web links which can assist with the resolution of the previously mentioned issues.
2. Ask National Delegates, Academic Institutions and like or sister organisations if they have information relating to the above issues.
3. Organise workshops / seminars / technical sessions / symposiums on the above topics at next significant FIG event . The composition of this event could -

- be at FIG Working Week - Israel 2009 or South East Asia Survey Conference - Bali 2009 or FIG Regional Conference - Vietnam 2009 or other
- be facilitated in co-operation with stakeholders or professional / scientific organisations, such as IAG? ION?
- involve case studies or invited presentations from CORS operators, industry, users, manufacturers etc
- focus on topics such as
  1. Guidelines, standards on positioning infrastructure
  2. Guidelines, standards, best practice on surveying and positioning
  3. Data management
  4. Business models
  5. Communication issues
  6. Hardware issues
  7. GNSS developments
  8. Vertical datum issues
  9. Integration and maintenance of geo-referenced datasets

- TS 8F - New Positioning Techniques Forum

This was another FIG Commission 5 'invited and designed' technical session. The purpose of this session was to bring together delegates who have an interest in new positioning techniques such as "AGPS, LBS, WiFi, RFID" and tele-communication (mobile phone) positioning. Presentations from Dr Volker Schwieger (FIG Commission 5 Vice Chair) and Dr Sandra Verhagen (IAG Commission 4, President) on the progress of their respective 'new positioning technique working groups' were provided to introduce the topic. The big questions posed by both



presenters - is what is the role of the surveyor in these new technologies? What is the role of the FIG and IAG working groups concerning these technologies?



Mr Lauri Wirola - Nokia

After setting the stage, Mr. Lauri Wirola of Nokia Devices R&D gave a fascinating talk concerning high accuracy positioning for the mass market. He presented the assisted GNSS approach taken by Nokia and insisted upon the fact that the market is growing very fast.

An interesting discussion amongst the 100 plus delegates then occurred. Points of interest that arose from this session where the -

1. Need for IAG and FIG to continue liaising and developing a work program to monitor this technology.
2. Number of potential 'assisted GNSS or GNSS positioning devices' by 2010, which was projected at 500 million.
3. Importance of surveyors to continually be proactive in the provision of 'models, algorithms and formats (ie RTCM)' with respect to new positioning techniques for greater accuracy in the future.
4. Reliance on GNSS CORS infrastructure to provide quality reliable real time corrections to

new positioning devices such as mobile phones.

5. Need to upgrade digital and non-digital geo-referenced datasets (and maps), as real time positioning infrastructure gets more accurate and prevalent. In addition to this, the cost associated with such an upgrade was considered.
6. Possible opportunity to integrate geodetic infrastructure with telecommunications.
7. User privacy and security issues
8. Need for standards for this level of infrastructure

All presentations from this session are recommended reading.



- Please note there were other FIG Commission 5 sessions such as : TS 3I - Deformation Monitoring - Techniques and Case Studies ; TS 5B - Applications of Remote Sensing and Imagery ; and TS6K - Traceability and Data Processing. These were joint sessions with other FIG Commissions, namely Commission 6.
- Standards Issues for FIG Commission 5 - David Martin

As reported on, several sessions were dedicated or had concerns with issues related to standards and

standardisation. In particular there was the Commission 5 session TS4C dedicated to GNSS standards.

One of the issues that became clear was the general misunderstanding of standards. Very often there are standards in a country. There are also internationally accepted standards and most notably those proposed by ISO. The problems lie in incompatibility of standards from one country to the next, and the perceived obsolescence or limited application of available international standards. It takes years to bring a standard to fruition and international acceptance. Over that time ideas may have changed and the standard may no longer be pertinent, or present an up to date modern approach to a problem.

The challenge for FIG Commission 5 lies in giving guidelines that are applicable to the surveyor in the field. One extremely relevant remark made was that developing countries need a reliable second opinion. They need standards that are easy to understand and apply. This is precisely the objective of the ISO standards. However their cost and potential obsolescence or limited application makes them a non-optimal choice for many surveyors around the world.

The FIG working group 5.1 concerned with these issues will strive to set up a series of links to different sites and interested parties to provide free and hopefully appropriate information for surveyors concerning standards that can be applied. This will be developed over the coming year and reviewed during the next working week in Eilat.

## STEERING COMMITTEE

The Commission 5 Steering Committee held several meetings whilst in Stockholm. They involved fruitful discussions with other FIG Commission Chairs, the Vice President of IAG Prof. Chris Rizos, IAG Commission 4 Chair Dr Sandra Verhagen, representatives from National Geodetic Survey (USA) - Mr Neil Weston, Mr Dave Doyle and Mr Dave Zilkoski ; Mr Brent Jones (ESRI), Mr Neil Ashcroft (Leica Geosystems) and other Commission delegates. The main purpose of the meetings was to discuss the workings (technical sessions and forums) at Stockholm and also future projects, workplans and events. Minutes from these meetings can be found on the FIG Commission 5 web site. Refer to- [http://www.fig.net/commission5/steering\\_committee/steeringcommittee.htm](http://www.fig.net/commission5/steering_committee/steeringcommittee.htm)



The FIG Comm 5 Steering Committee with FIG President

The Steering Committee held an Open Commission meeting for its delegates. In this meeting we saw a lot of new faces and we listened to new ideas and proposals regarding not only FIG Commission 5 but also the entire FIG. Also Prof. Rudolf Staiger (FIG Commission 5 Chair) and Rob Sarib (FIG Commission 5 Vice Chair) attended ACCO. Refer to Steering Committee Minutes for Commission 5 issues discussed at ACCO.

## SOCIAL ACTIVITIES

In true FIG Commission 5 style many of our delegates attended the numerous social functions with gusto, vigour and determination to maintain our reputation as hard working folk who also know how to have fun. To achieve this the Swedish hospitality provided exemplary assistance which enable us to enjoy the social festivities and nightlife of Stockholm to the early hours. FIG Commission 5 wish to thank all delegates and 'Swedes' who made the visit to Stockholm a memorable one.

The social functions of the working week that FIG Commission 5 participated in were the-

- SLF 100<sup>th</sup> Celebrations at Nobel's Old Factory, Vinterviken



- Welcome Reception at the famous Stockholm City Hall



- FIG Foundation Dinner at the Vasa



- Commission 5 Dinner at Källaren Movitz in Old Town (Gamla stan) in Stockholm



- Gala Dinner at the Vintergarden at the Grand Hotel



- Farewell Reception in the foyer of Norra Latin



- Mid Summer celebrations at Skansen



## CONCLUSION

For FIG Commission 5 the Working Week 2008 in Stockholm was a very successful event. The participation at the Technical Programme was excellent and our numerous meetings very productive. The successful introduction of the Peer Review System has showed positive first results and that the overall quality of the papers is increasing. Also, I would like to thank all participants and friends of our Commission for your support and your active participation. Last but not least I would like to thank my Commission Officers for their valuable hard work.

Rudolf Staiger



Thank You Stockholm !

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### COMING EVENTS

16-19 September, Savannah, Georgia, USA  
ION GNSS 2008.

Web site:

<http://www.ion.org/meetings/#gnss>

3-8 May, Eilat, Israel  
FIG Working Week and XXXII General  
Assembly

New Horizons across the Red Sea -  
Surveyors Key Role in Accelerated  
Development.

Web site: [www.fig.net/fig2009](http://www.fig.net/fig2009)

Contact: [fig@fig.net](mailto:fig@fig.net)

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If you would like to circulate Commission 5  
NEWS to all our members please email  
your item for consideration to the Vice  
Chair Administration -

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