

**Report to the 34th General Assembly
FIG Working Week 2011 in Marrakech, Morocco**

FIG Commission 5 – Positioning and Measurement

End of Term Report 2007–2010

1. General

The fields of interest of Commission 5 are traditionally the science of measurement and the acquisition of reliable and accurate survey data related to the position, size and shape of natural and artificial features of the earth and its environment including variation with time.

After the creation of the work plan for the term 2007 to 2010 and the team building process Commission 5 established 4 working groups which covered the various areas of current interest.

2. Working Groups

WG 5.1 – Standards, Quality Assurance and Calibration

Chaired by David Martin (France, also Chair of FIG Standards Network)

- Working Group 5.1 was present and active at all Working Weeks, Regional Conferences and at the FIG-Congress in Sydney and organized on a regular base sessions on standards, calibration and quality in measurements.
- FIG publication No. 9 Recommended Procedures for Routine Checks of Electro-Optical Distance Meters (EDM) FIG Guide, 1994 was thoroughly discussed. The re-edition of this document is planned after the revision of ISO 17123-4 Electro-optical distance meters (EDM instruments).
- WG 5.1 is assisting ISO especially in conjunction with the technical development of the ISO-Standard “17123 - Field procedures for testing geodetic and surveying instruments”.
- Two new standards under ISO/TC 172/SC 6 are presently under discussion/development: ISO 17123-9 "Optics and optical instruments - Field procedures for testing geodetic and surveying instruments – Part 9: Terrestrial laser scanners" and Part 10: “Non prisma measurement (reflector less distance measurements by electronical tacheometers)”.
- One of the principal aims of the Working Group 5.1 over the coming year and indeed over the full period 2011 to 2014 will be to examine and eventually promote guidelines and recommendations for standards and quality in survey measurements based on the ISO Guide to Uncertainty in Measurement (GUM) and its supplements.

WG 5.2 – Reference Frame in Practice

Chaired by Mikael Lilje (Sweden)

- Working Group 5.2 was present and active at all FIG Working Weeks, Regional Conferences and at the FIG Congress in Sydney. Their multiple sessions were in relation with the measurement, monitoring and modeling of the dynamic earth and also how users are using such information for many types of applications.
- Another achievement of this working group was to continue the relationship with sister organisations such as International Association of Geodesy (IAG) and the Permanent Committee for GIS Infrastructure Asia-Pacific (PCGIAP) on reference frame related projects such as the Asia Pacific Reference Frame (APREF) and the Global Geodetic Observing System (GGOS). Working with these organisations is expected to carry on in 2011 via the above mention projects but also through the African Reference Frame (AFREF) project in Marrakech and attendance to International Union of Geodesy and Geophysics symposium in Melbourne, Australia.
- Mikael Lilje, the new Chair of Commission 5 for the period 2011 to 2014, also became the FIG representative on the Galileo Geodetic Reference Interface Working Group

WG 5.3 – Integrated Positioning, Navigation and mapping Systems

Co-chaired by Andrew Hunter and Naser El-Sheimy (Canada)

This Working Group was unfortunately not as active as expected. The Chairs of this Working Group were required to resign during their term of office due to their academic and work priorities.

WG 5.4 – Global Navigation Satellite Systems

Chaired by Volker Schwieger (Germany)

- Working Group 5.4 was present and active at all Working Weeks, Regional Conferences and also at the FIG Congress in Sydney last year. Sessions about GNSS CORS networks were successfully and were facilitated in partnership with Working Group 5.2 “Reference Frames in Practice”.
- The FIG publication no 49 “Cost Effective GNSS Positioning Techniques” was published for the FIG Congress in Sydney. Refer to website location <http://www.fig.net/pub/figpub/pub49/figpub49.pdf> to view this publication. Neil Weston and Volker Schwieger were the authors. Neil Weston presented the work at the Congress.
- Working Group 5.4 supported German Aerospace Centre (DLR) to acquire kinematic GPS tracks that will be used to evaluate the TanDEM-X digital elevation model. There was a special session dedicated to the evaluation of the results at the Sydney Congress. The work is still ongoing. For the Working Week in Marrakesh 2011 a final report is planned.
- Additionally the latest developments in GNSS and related technologies were treated under the headline “Low Cost GNSS and Positioning Techniques”

3. Cooperation

3.1 Cooperation with Other Commissions

During the whole period, Commission 5 continued to work with Commission 4 and 6 on topics relating to deformation measurements, calibration of instruments, Terrestrial Laser Scanning, long range measurement, satellite and terrestrial imagery measuring techniques (in particular mobile and static laser scanning) and vertical datum/reference frame issues for hydrography. This cooperation involved holding joint technical sessions and meetings at FIG related events.

3.2 Cooperation with Sister Organisations

During the last four years, the Commission 5 Steering Committee maintained together with Vice President Matt Higgins our developing relationship with various sister or like organisations such as the International Association of Geodesy (IAG) and the Permanent Committee for GIS Infrastructure Asia-Pacific (PCGIAP). This was achieved by convening joint technical sessions and holding joint administrative meetings during the FIG Sydney Congress on significant issues such as the development and current status of Asia Pacific Reference Frame (APREF) and the Global Geodetic Observing System (GGOS). Both projects concerned developing ‘mm’ accurate reference frames that will provide an important platform for studying global change such as rising sea level, climate change, the deforming earth, and also numerous issues pertaining to positioning infrastructures and applications.

It is anticipated that cooperation with both organisations will continue during the next FIG 2011-14 term, as discussions have already begun with both to actively participate at the next IUGG Melbourne conference and the FIG Work Week in Marrakesh, Morocco.

3.2 Cooperation with UN

The International Committee on Global Navigation Satellite Systems (ICG), met in Turin, Italy from 18 to 22 October 2010, in St Petersburg in Russia, from 14 to 18 September 2009 and in Pasadena, California, USA, from 8 to 12 December 2008. Vice President Matt Higgins was attending all three meetings and representing FIG also as Co-Chair of Working Group D of the ICG. Mikael Lilje, the incoming Chair of FIG Commission 5 was also at the last meeting in Turin as our Commission’s representative on Task Force D1 on Geodetic References.

Also Vice President Higgins convened an ICG WG 4 workshop on GNSS Compatibility and Interoperability at the International GNSS Symposium held on the Gold Coast, December 2009.

ICG was formed several years ago as a result of recommendations of the UN Committee on the Peaceful Use of Outer Space (COPUOS). At these meetings reports are given on the status of major GNSS sub-systems and the activities of task forces on geodetic and timing references. Matt Higgins needs to be commended for his role as the FIG representative in this UN committee, and Commission 5 would like to also thank him for all his efforts.

3.3 Cooperation with ISO

Prof. Hans Heister (Munich) was representing FIG and our Commission at the ISO-Committee 172-SC6 (Geodetic Instruments) during the last 4 years very actively. He participated at all meetings and was not only hosting the ISO meeting 2008 in Munich, but he was also heavily involved in the finalisation of various parts of the ISO- guidelines “17123 - Field procedures for testing geodetic and surveying instruments”. We would like to thank Hans for his strong and appreciated activities for FIG and Commission 5 during the last years.

4. Events

A summary of the Commission 5 activities at events during the last 4 years can be found on our website: however the highlights were:

2007

- Rudolf Staiger attended the 24th General Assembly of International Union for Geodesy and Geophysics (of which IAG is a member) in Perugia, Italy July 2007 as the official FIG representative. FIG Vice President Matt Higgins, our Commission 5 liaison officer, also participated and provided reports from several major.
- Another highlight was the signing of United States Institute of Navigation (ION) / FIG MOU in March 2007 by FIG Council and ION representative Dorota Brzezinska. This signing will now provide a clear mandate for ION, FIG and IAG to work towards a three-way co-operation on GNSS matters.
- Naser El Sheimy assisted with the organisation of the FIG / ISPRS / IAG 5th International Symposium on Mobile Mapping Technologies in Padova, Italy May 2007.

2008

- At the Working Week held in Stockholm Commission 5 had 18 related technical sessions, comprising of almost 100 technical papers and poster presentations. The symposium was well attended, especially the GNSS-RTK-Network-Forum
- FIG Vice President, Matt Higgins attended the 4th International Exhibition and Scientific Congress “GEO-Siberia-2008” in Novosibirsk, Russian Federation from 22 to 24 April 2008. GEO-Siberia-2008 was organised by the Siberian State Academy of Geodesy (SSGA) and the International Exhibition Centre “Siberian Fair”.
- In June, Volker Schwieger the Chair of WG 5.4 attended the 1st International Conference on Machine Control & Guidance in Zürich, Switzerland. The conference was co-sponsored by FIG Commissions 5 and 6 and the Institute of Navigation Switzerland. The conference attracted more than 130 practitioners and scientists from all over the world. The first attempt to bring together manufactures of geodetic instruments as well as of construction and agricultural engines, the respective software companies, users of both sectors as well as researchers of different disciplines was very successful.
- In October, Vice President Matt Higgins and Vice Chair of Administration for Commission 5 Rob Sarib attended the 14th Australian Remote Sensing and Photogrammetry Conference in Darwin, Australia. At this event they represented our

Commission, presented papers and held a workshop on GNSS, CORS and their effect on the spatial science and imagery industries

2009

- Vice President Matt Higgins attended the FIG - World Bank Conference, Washington D.C., 9-10 March 2009. At this event he presented on the topic “Positioning Infrastructures for Sustainable Land Governance”.
- South East Asia Survey Congress in Bali, Indonesia (August 2009) – Vice President Matt Higgins and Rob Sarib attended this conference as FIG and Commission 5 representatives.
- Chair of Commission 5 Rudolf Staiger attended INTERGEO 2009 in Karlsruhe, Germany (September 2009). Like in the years before INTERGEO was the worldwide largest tradeshow regarding surveying equipment. From the FIG point of view it is interesting to note that this event is becoming more and more an international one.
- Regional Conference Hanoi, Vietnam (October 2009) – Commission 5 were involved in facilitating 11 technical sessions that were related to modern survey infrastructure and how they assist the land governance and building capacity

2010

- Vice President Matt Higgins attended the 1st Asia Oceania Regional Workshop on GNSS, 25-26 January 2010, Bangkok, Thailand. Vice President Higgins provided a keynote presentation and was involved in numerous discussions on implications of next-generation of Global Navigation Satellite Systems for the Asia Oceania region.
- IGS Workshop and Vertical Rates Symposium, Newcastle Tyne, UK, 28 June – 2 July 2010 was attended by incoming Commission Chair Mikael Lilje. This workshop focused on the application and status of current IGS operations and possibilities for future improvements; and the applications of GNSS to tide gauge vertical land movement, glacial isostatic adjustment (GIA), subsidence and tectonic motion.
- FIG Commission 5 and 6 were represented at the workshop on “Innovative Technologies for an Efficient Geospatial Management of Earth Resources” Ust-Kamenogorsk, Eastern Kazakhstan, 3-7 September 2010.
- Dr David Martin attended the 12 International Workshop on Accelerator Alignment (IWAA) which was held at the Deutsches Elektronen-Synchrotron (DESY) between 13 and 17 September 2010. This workshop is nominally held every two years at particle accelerator laboratories around the world. They are devoted to large scale and high precision positioning of particle accelerators and photon science experiments, focusing on the exchange of information between geodesists, surveyors, physicists and others specialists.
- The 16th Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) Meeting, held in Singapore, 18 – 21 October 2010 was attended by Reference Frame WG member Graeme Blick. At this event numerous discussions, presentations, and reports were delivered by working group members on topics such as - Geodesy technologies and

applications; Geospatial data management and service; Spatially enabled government and society; and Institutional strengthening.

- Dr David Martin also attended the Large Volume Metrology Conference held Chester UK, 2 - 3 November 2010. This forum provided delegates the opportunity to discuss and actually see the latest innovations and instruments in the field of portable 3D industrial measurement technologies.
- 2nd Asia Oceania Regional Workshop on GNSS - “Asia Oceania is the Showcase of New NSS”, Melbourne Australia, 21-22 November 2010 was attended by FIG Vice President Matt Higgins and Commission 5 Vice Chair of Administration Rob Sarib. Vice President Higgins was an invited guest and presented on the topic “Australia’s Requirements and Contributions in the Multi GNSS Era”. The event was hosted by the Japanese Space Agency JAXA and the Royal Melbourne Institute of Technology (RMIT) University..
- Volker Schwieger attended the First International Conference on Indoor Positioning and Indoor Navigation (IPIN) from 15th - 17th September, Zürich, Switzerland. The conference was hosted by the ETH Zürich and was a great success with 220 presentations and 445 participants of 47 different countries. The researchers were from different disciplines like geodesy, electronic engineering, and informatics. The topics ranged from ultra-sonic and WiFi positioning to indoor GNSS and industrial metrology.
- Mikael Lilje and Rudolf Staiger attended the INTERGEO 2010 in Köln, Germany, the largest trade exhibition on Geodesy, GIS and Land management, as well as the first INTERGEO academy covering the topic “GNSS 2010 – Surveying and Navigation in the 21st century”. Mikael also presented on SWEPOS CORS network and its activities in Sweden.

Rudolf Staiger
Chair, FIG Commission 5, 2007-2010

March 2011