FIG Commission 5 – Positioning and Measurement

Work Plan 2011–2014

1. Title

Positioning and Measurement

2. Terms of Reference

- The science of measurement (instrumentation, methodology and guidelines)
- The acquisition of accurate and reliable survey data related to the position, size and shape of natural and artificial features of the earth and its environment and including variation with time.

3. Mission statement

The mission of Commission 5 is to:

- focus on modern technologies, technical developments and assist surveyors, engineers and GIS/LIS professionals through guidelines and recommendations, to choose and utilise those methods, technologies and instruments that are most appropriate to different applications.
- facilitate and follow technical developments through collaboration with other FIG Commissions and other international organisations; participation in appropriate meetings; and the preparation of appropriate publications.
- foster and support research and development and stimulate new ideas in the fields of expertise represented within the commission.
- formulate and formalise collaboration with manufacturers on the improvement of instrumentation and associated software.
- FIG Events - present and promote the work of the Commission and its working groups on an on-going basis at FIG Working Weeks, FIG Regional Conferences and other relevant technical meetings and in appropriate FIG and other media.

4. General

This work plan covers the development, use and integration of technologies for positioning and measurement and the associated standardisation, best practice and fundamental reference frame issues. Many of the issues are global in nature and Commission 5, along with many other associations, are well suited to tackle the technological challenges that we face. FIG Council has also requested the Commission 5 to cooperate with the United Nations agencies to address global problems such as sustainable development and humanitarian needs, where disciplines covered by Commission 5 are at the heart of delivering solutions for the spatial aspects of these important global problems. Specific activities aimed at developing countries include examination of Low Cost Surveying Technologies, assistance with implementation of modern Geodetic Reference Frames and associated infrastructure and contribution to appropriate Continuing Professional Development programmes.

In addition to the specific activities above, Commission 5 will support and contribute to FIG Task Forces and Networks, especially to the Standards Network.

5. Working Groups

Working Group 5.1 – Standards, Quality Assurance and Calibration

Policy Issues

- Influence the development of standards affecting positioning and measurement instruments and methods, in collaboration with the FIG Standards Network and through participation in the relevant technical committees (TCs) of the International Standards Organisation (ISO) and other appropriate bodies.
- Acceptance controls, quality assurance and certification and their impact on the surveying profession.
- Testing and calibration of measuring instruments.
- Assist other Commission Working Groups to implement Standards from TC 172/SC 6 and ISO TC211 as appropriate.

Chair

David Martin (France), e-mail: david.martin@esrf.fr

Specific project(s)

- Develop a summary guide on instrument testing following the principles laid out in the ISO standards related to Optics and optical instruments – Field procedures for testing geodetic and surveying instruments.
- Present and promote the use of standards and guidelines to the surveying community.
- Establish guidelines and recommendations for instruments taking into account latest development in surveying technology.
- Promote guidelines and recommendations based on the ISO Guide to Uncertainty of Measurements (GUM) and its supplements.
- Review Standards coming from ISO TC211 for relevance to Positioning and Measurement.

Workshop(s)

- Participation in FIG Working Weeks and other major Commission events (see events section below) with dedicated technical sessions and/or workshops as appropriate.

Publication(s)

- Summary guide on instrument testing following the principles laid out in the ISO standards related to Optics and optical instruments - Field procedures for testing geodetic and surveying instruments.

Timetable

- Draft publications will be presented at FIG Working Weeks during the term of this plan and according to a timetable to be developed by the Working Group Chair.
- Realising tutorials and workshops on topics of interest and related questions during the whole period

- Facilitating special sessions in FIG events (FIG Congress, FIG Working Weeks, and FIG Regional Conference) as well as other special events when appropriate.
- Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2014.

Beneficiaries
- FIG member associations, manufacturers and users of survey equipment, governments, standardisation organisations, decision makers, GIS developers and users, surveying businesses, individual surveyors.

Working Group 5.2 – Reference Frames

Policy issues
- Work to bring together all organisations involved in defining or using reference frames to develop common approaches and avoid duplication. Such organisations include FIG, the International Association of Geodesy (IAG), ISO, groups of national mapping agencies, other influential national agencies (such as the US Department of Defence's National Geospatial-Intelligence Agency (NGA), which is responsible for WGS84.) and alliances of commercial organisations (such as Open GIS Consortium and the European Petroleum Survey Group).
- Continue the existing co-operation with IAG on the Regional Reference Frame Projects such as AFREF, APREF, EUREF, NAREF, and SIRGAS.
- Consider options for the development and implementation of 4-dimensional datums that incorporate the effects plate tectonic and regional effects such as those due to earthquakes or local effects such as landslides.
- Provide background technical information on relevant issues written in a way that is accessible to the surveying practitioners.
- Develop an inventory of approaches to reference frame issues in different countries (including transformation methodologies) that is accessible to surveying practitioners.
- Examine how surveying practitioners can access the reference frame, through less emphasis on networks of ground monuments and more emphasis on Global Navigation Satellite Systems (GNSS) base stations.
- Provide information on the maintenance of CORS networks to ensure long-term stability
- Liaise with Commission 4 to review, revise and update FIG Publication 37, Vertical Reference Surface for Hydrography

Chair
Graeme Blick (New Zealand), e-mail: gblick@linz.govt.nz

Specific project(s)
- Initiate, contribute and facilitate meeting(s) of all organisations involved in defining or using (regional) reference frames to develop common approaches and avoid duplication.
- Continue development of Technical Fact Sheets that briefly explain basic concepts, practical applications and issues and which summarise the activities of organisations with specific responsibilities in the field.
- Ensure terminology used in above publications conform to and give substance to the relevant Standards coming from ISO TC211.
- Begin a forum to discuss the implementation of 4 dimensional datums.

- Ensure that the working group web page is updated and accessible.

- Workshop(s)
- Participation in FIG Working Weeks, FIG Regional Conference and other major Commission events (see events section below) with dedicated technical sessions and/or workshops as appropriate.
- Realising tutorials and workshops on topics of interest and related questions during the whole period.
- Facilitating Special Sessions on FIG events like FIG Congress, FIG Working Weeks, and FIG Regional Conference as well as on additional special events like ICG meetings as well as IAG-symposium.

Publication(s)
- Maintaining and developing the Web page
- FIG Working Weeks will include technical papers on specific issues and presented by Working Group members and other invited experts.
- Technical Fact Sheets as outlined above.

Timetable
- Draft publications will be presented at FIG Working Weeks during the term of this plan and according to a timetable to be developed by the Working Group Chairs.
- Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2014.

Working Group 5.3 – Geodetic and Positioning Infrastructure

Policy issues
- Examine the positioning services using CORS.
- Examine various positioning techniques using GNSS
- Examine existing automated positioning software via WWW
- Real time networks
- GNSS products and advancements
- Provide FIG input during planning and implementation phases associated with programs of GPS Modernisation and GNSS Development.

Chair
Neil D. Weston (USA), e-mail: Neil.D.Weston@noaa.gov

Specific project(s)
- Report on the development, possibilities and limitations of new technologies (e.g. via web pages) for surveyors regarding GNSS infrastructure and Positioning techniques.
- Prepare guidelines for practitioners on making the best use of systems to achieve the results required for particular applications.
- Realising tutorials and workshops on topics of interest and related GNSS positioning techniques.
- Facilitating Special Sessions in FIG Events (FIG Congress, FIG Working Weeks, and FIG Regional Conferences) as well as other special events when appropriate.
- Develop FIG input to GPS Modernisation and GNSS Development.

- Provide a yearly summary on milestones achieved with regard to GNSS infrastructure (constellations, signals etc.).
- Collaborate with other Commissions and other international organisations (including IAG and ISPRS) and with equipment, software and service providers.
- Continue commitment to relevant inter-disciplinary events including the series of Symposia on Machine Guidance and Control (joint with IAG and ISPRS).

Workshop(s)
- Participation in FIG Working Weeks and other major Commission events (see events section below) with dedicated technical sessions and/or workshops as appropriate.

Publication(s)
- Guidelines on making the best use of emerging systems.
- Guidelines for practitioners on making the best use of systems to achieve the results required for particular applications.
- Yearly summary on milestones achieved with regard to GNSS infrastructure (constellations, signals etc.).

Timetable
- Draft publications will be presented at FIG Working Weeks during the term of this plan and according to a timetable to be developed by the Working Group Chair.
- Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2014.

Beneficiaries
- FIG member associations, manufacturers and users of survey equipment, governments, standardization organizations, decision makers, GIS developers and users, surveying businesses, individual surveyors.

Working Group 5.4 – Kinematic Measurements

Policy issues
- Bring to together practitioners, instrument manufactures and scientists that deal with kinematic measurements
- Maintaining contact with instrument and sensor manufactures to provide state-of-the-art information to the users
- Co-operation with Commission 6 WG “Machine Guidance and Control”
- Co-operation with study groups IC-SG2 and IC-SG3 of the Inter-commission Committee on Theory (ICCT) of the International Association of Geodesy

Chair
Volker Schwieger (Germany), e-mail: volker.schwieger@iagb.uni-stuttgart.de

Specific project(s)
- Publications (e.g. via web) and a special issue in a well-known scientific journal about the following topics:
  1. Kinematic aspects of geodetic instruments like total stations and GNSS receivers as well as with typical kinematic sensors like inertial measurement units, odometers, etc.

2. Time issues like synchronisation and dead time.
3. Integration of different sensors to Multi-Sensor-Systems.
4. Quality of integrated kinematic measurements

Workshops
- Realising tutorials and workshops on interesting topic related questions during the whole period.
- Facilitating Special Sessions on FIG events like FIG Congress, FIG Working Weeks, and FIG Regional Conference
- Facilitating on additional special events, e.g. Mobile Mapping Technology Symposium, Krakow, Poland, 2011, 1st International Workshop on the Quality of Geodetic Observation and Monitoring Systems, Munich, Germany, 2011 and 3rd International Conference on Machine Guidance and Control in Stuttgart, Germany, 2012.

Publications
- Technical papers at Working Weeks, Regional Conference and Commission 5 symposia and workshops
- Providing technical background information (e.g. via web pages) for surveyors dealing with kinematic tasks and applications during the whole period.
- Providing a Special Issue of a well-known scientific journal e.g. the Journal of Applied Geodesy in 2013/14

Timetable
- Working group final report and outcomes will be presented at dedicated session, FIG Congress 2014.

Beneficiaries
- FIG member associations, manufacturers and users of survey equipment, decision makers, surveying businesses, individual surveyors, scientists.

Working Group 5.5 – Ubiquitous Positioning (Joint Working Group with Commission 6)

Policy issues
This group, which is a joint working group between FIG and IAG, will focus on the development of shared resources that extend our understanding of the theory, tools and technologies applicable to the development of ubiquitous positioning systems. It has a major focus on;
- Performance characterization of positioning sensors and technologies that can play a role in the development of ubiquitous positioning systems
- Theoretical and practical evaluation of current algorithms for measurement integration within ubiquitous positioning systems.
- The development of new measurement integration algorithms based around innovative modeling techniques in other research domains such as machine learning and genetic algorithms, spatial cognition etc.
- Establishing links between the outcomes of this WG and other IAG and FIG WGs (across the whole period)
- Generating formal parameters that describe the performance of current and emerging positioning technologies that can inform FIG and IAG members.

Co-Chairs
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Workshops
To be held in conjunction with Mobile Mapping Technologies (MMT) Symposium, Krakow, Poland 2011

Further activities:
- Participation in FIG Working Weeks and other major Commission events (see events section below) with dedicated technical sessions and/or workshops as appropriate.
- Several papers submitted by working group participants to FIG meeting in Morocco, 2011.
- Several papers to be submitted by working group participants to MMT, Poland, 2011.
- New algorithms for dynamic modeling and data fusion in real-time underway.
- Website for sharing code and data to be established

Publications
- Technical Papers at Working Weeks, Regional Conference and Commission 5 Symposia and Workshops
- Reporting on the performance characteristics of a broad range of MEMS inertial sensors derived from extensive practical testing and benchmarking. (2011-2012)
- Reporting on performance characterization of positioning technologies the development, possibilities and limitations of new technologies. (across the whole period)
- Establishing components of an open source platform for researchers to rapidly deploy sensors as well as evaluate and develop integration algorithms. (across the whole period)
- Developing and report on taxonomy for users of ubiquitous positioning systems that shows the performance capabilities of sensors and typical applications. (across the whole period)

Timetable
- Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2014.

Joint Study Group 6.2.2 on Laser Scanning jointly with Commission 6 (Commission 6 has lead and work plan is described in Commission 6 work plan)

6. Co-operation with Other Commissions and organisations

- Study Group 6.2.2 – Laser Scanning (Commission 6 has the lead)
- Working Group 5.5 – Ubiquitous Positioning Systems (Commission 5 has lead)

Commission 5 will collaborate with Commission 4 to review and revise (where required) FIG Publication 37, Vertical Reference Surface for Hydrography.

Commission 5 will also collaborate with other FIG Commissions as appropriate.

7. Co-operation with United Nation Organisations, Sister Associations and other Partners

Commission 5 is the lead Commission for the Memorandum of Understanding between FIG and the United Nations Office for Outer Space Affairs (UN-OOSA). ICG (International Committee on GNSS) will be the focus of cooperative activities from 2011 to 2014. FIG is co-chairing the Task Force on Geodetic Reference Systems together with IAG and IGS.

Commission 5 is also committed to cooperation with sister associations, especially the International Association of Geodesy (IAG) with which FIG has a Memorandum of Understanding. Commission 5 has also specific liaison interest with the International Society for Photogrammetry and Remote Sensing (ISPRS) and the Permanent Committee on GIS Infrastructure Asia Pacific (PCGIAP). The Commission 5 Steering Committee will ensure that Working Group activities and Commission 5 events further these goals of cooperation with sister associations. For example Commission 5 endeavour to assist with projects, create publications and facilitate events that are agreed with IAG on topics such as:

- AFREF - African Reference Frame
- APREF - Asia Pacific Reference Frame
- Reference systems/ frames,
- GNSS CORS and the use of IGS products
- Mobile Mapping Technology
- Optical 3-D Measurement Techniques
- Deformation Measurement
- Ubiquitous Positioning (together with FIG Commission 6)
- Vertical Reference Systems

Commission 5 is also committed to the Cooperation Agreement with the US based Institute of Navigation (ION) and will undertake activities as agreed with ION, especially in relation to GNSS.

8. Commission Officers

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January 2011