



Newsletter

FIG Commission 5

Positioning and Measurement
"A World and a Profession in Transition"
Newsletter 4, March 2001

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Editors corner

By Mikael Lilje, secretary FIG Commission 5

FIG Commission 5 has been very active in the last year organising seminars at various places, mainly around the Mediterranean area. In September we were the main organisers of the very much appreciated seminar on Malta and in January, WG-5.3 through its chair Naser el-Sheimy organised the 3rd International Symposium on Mobile Mapping Technology. Malta was a co-operation between several commissions and Cairo was a co-operation between several international organisations. Presented papers can be retrieved from our homepage or FIGTree.

Fig Working Week will be held in Seoul, South Korea in May and the program looks very promising. FIG Commission 5 will be very active in the program, as usual. We are

e.g. organising a work shop concerning guidelines of different instruments.

The preparations for the next Congress (Washington 2002) is on the way with the Call for Papers already out.

We were asked by Mr Marek Prikryl if we were able to publish a report that he has written concerning height determination in local networks. We have included an abstract and the paper can be found on our homepage.

Please, also visit our homepage. The address is www.lm.se/fig5. A homepage can always be improved and please help us with that. Information about FIG can also be found on FIGTree (www.fig.net/figtree/).

News from the chairman

By Jean-Marie Becker, chair FIG Commission 5



Dear colleagues, Since we published our Newsletter 3 in May 2000, Fig Commission 5 and its Working Groups have been deeply involved in the organisation, participation and sponsoring of several national and international events. In the following Newsletter, more details are given in the reports from some of them like *FIG Working Week* in Prague (Czech Republic) in May 2000, the international seminar *The Mediterranean Surveyors in the new Millennium* in St. Juliens (Malta) in September 2000 and the International Symposium on *Mobile Mapping Technology* in January 2001 in Cairo (Egypt).

In **Prague** our colleague Vaclav Slaboch (WG 5.1) had a very important role in the organisation and implementation of all arrangements both the General Assembly, the

technical program and other activities. He worked very hard and made the whole event to a success to the satisfaction of all participants in despite of all technical and financial problems. I want to thank him for all his efforts and congratulate him for the success. I hope he had time to take a well-needed holiday after the event.

In **Malta**, Commission 5 was responsible for the technical program in collaboration with the commissions 2, 4, 6 and 7. We had participants and speakers from several sister organisation like International Cartographic Association (ICA), International Association of Geodesy (IAG), European Council of Geodetic Surveyors (CLGE), European Association of Private Practitioners (SEPLIS) and European Union (EU) who contribute to the general debate concerning the future of the profession especially in the countries around the Mediterranean. Many participants

have expressed their satisfaction both concerning the technical program and the arrangements and they asked for similar meetings regularly in the future.

The **Cairo** Symposium was sponsored and organised by Commission 5 together with IAG/SC4 and ISPRS/WGII. It is especially our colleague Naser El Sheimy (WG 5.3) together with the local organisation who has made it to a success both concerning the arrangements and for the technical program. I congratulate him and his colleagues for this beautiful symposium and I hope that several colleagues will follow his example. France and Nicolas Paparoditis (WG 5.4) will try to do so year 2005 in Paris.

I participated also to the following events representing Commission 5:

- In **Geneva** (Switzerland) in April 2000 for discussions with Commission 6 concerning common subjects and activities.
- In **Heerbrugg** (Switzerland) in May 2000 at a working meeting of the ISO/TC 172/SC6 concerning the coming standards for surveying instruments. More about it will be presented at the workshop in Seoul during the FIG Working Week.
- In **Berlin** (Germany) in October 2000 was I invited to INTERGEO by the German organisers. As usual this event continues to be the greatest event for the surveyors and survey profession in the world and offer them to see everything on hard and software. I can only recommend each FIG member and especially C5 colleagues to go to INTERGEO. This is the best way to understand how large our profession is.

- It was also my intention to travel to **Bogota, Colombia** in November 2000 to represent FIG and C5 at the annual meeting of the Colombian Surveyors Association. Two papers were prepared for that occasion. Unfortunately, I was stopped due to health reasons and Markku Villikka had to replace me and do the presentations.
- Mikael Lilje represented FIG and C5 in February 2001 by participating to the IAG symposium in **Cartagena**, Colombia.

We hope to develop this type of collaboration with our sister organisations ISPRS and IAG more in the future were we are co-sponsors of certain events (e.g. Cairo). Of course other organisations are also of interest for FIG. We will also co-sponsor and participate to the coming FIG/IAG/ISPRS event in Berlin (Joint Turkish and German Geodetic Days) in April as well as the IAG/SC4 Symposium on 3-D-Measurement technologies in **Wien** October 2001. We are also proud to be co-sponsors at KIS2001 in Banff in June.

I hope that many of you will have the possibility to join us in **Seoul** in May and participate to our workshop on "Standards and guidelines for Checking, Maintenance and Calibration of Survey Instruments". This workshop in Seoul will give a good view over the progress made in all fields by our C5 WG's and the actual status of the art. You are all welcome to participate to the discussions. I am looking forward meeting you in Seoul!

PREVIEW OF FIG WORKING WEEK IN SEOUL, SOUTH KOREA, MAY, 2001

By Matt Higgins

Commission 5 will be very active at the FIG Working Week in Seoul in May 2001. Commission 5 will be in charge of 4 technical sessions and will participate in joint sessions. The Commission 5 Technical Sessions are:

- Session 4 on Digital Photogrammetry and Remote Sensing
- Session 8 on Reference Frame in Practice
- Session 11 on Permanent GPS Reference Networks Session 14 on New Technology and Applications

There will also be a Workshop for 3/4 of a day on "Guidelines for Check, Maintenance and Calibration of Survey Instruments".

Titles and Abstracts of papers to be presented are available at the Internet address: <http://www.fig.net/figtree/pub/proceedings/korea/programme.htm>

The Commission will also take the opportunity for an open meeting for all delegates and for a meeting of the Commission Steering Committee.

Registration details for the Working Week in Seoul are given in the Forthcoming Events section toward the end of this newsletter.

COMPARING TRIGONOMETRIC DETERMINING OF HEIGHT DIFFERENCES (TDHD) AND GPS (GLOBAL POSITIONING SYSTEM) IN LOCAL NETWORKS

By Marek Prikryl (contact info: marekprikryl@atlas.cz)

Abstract

Atmospheric influence, primarily problem of the refraction has indispensable influence on measuring accuracy in geodesy, which especially effects quality of measuring results for trigonometric determination of altitude. We tried to eliminate its influence on measuring sets from extreme different conditions in the mild climate zone (Czech Republic, Jeseníky) and in the tropical climate zone (Ghana, New Bortianor). Part of our work was idea to verify the theory determination of refraction influence in practice in extreme conditions.

Primary importance of precision and effectiveness when establishing local networks in respect of demand of practice, and on combining terrestrial and celestial determining height differences inspired us to possibility of comparing trigonometric determining of height differences (TDHD) and GPS (Global Positioning System). Therefore, the adequately investigated method TDHD with which we can partly eliminate atmospheric influences to minimum when keeping specific measuring and counting methods, and the method GPS which suits demand of current practice in aspect of economy, precision and speed of measuring and calculation.

Note from the Editor

The rest of the paper can be found as a pdf-file on FIG Commission 5 homepage.

REPORT FROM FIG WORKING WEEK PRAGUE, CZECH REPUBLIC 22-26 OF MAY, 2000

By Jean-Marie Becker, Mikael Lilje and Matt Higgins

INTRODUCTION

The FIG Working Week was organised in Prague, Czech Republic between the 22nd and 26th of May. There were over 300 delegates from 40 countries. The Czech-Slovak-Polish Surveying Days were also organised at the same time and run in their own languages which, unfortunately, meant that most of the local participants preferred this event.

Commission 5 was well represented by its entire Steering Committee of Chair, Vice Chair, Secretary and all Working Group Chairs (Jean-Marie Becker, Matt Higgins, Mikael Lilje, Vaclav Slaboch, Hansbert Heister, Michel Kasser, Naser El-Sheimy, Nicolas Paparoditis and Paul Cross). Also, Vaclav Slaboch played an active and important role during planning for the Working Week as Vice Chair of the Organising Committee. Such local involvement is crucial to the success of Working Weeks and it was good for Commission 5 to have Vaclav so heavily involved. This report is a summary of events. For more information on a specific topic, please contact the relevant Steering Committee member.

GENERAL ASSEMBLY

The General Assembly met at the start and end of the working week, as usual. 35 countries were represented by 40 member organisations of the federation. During the plenary sessions, many items passed with little discussion or controversy. A summary will be published on the FIG web site in due course.

Four new member associations from Czech Republic, Lebanon, Colombia and Portugal were accepted. Peter Dale was accepted as Honorary President and Grahame Lindsay and Andrzej Hopfer were accepted as

Honorary Members. FIGTree has been moved to a new domain (www.FIG.net) and there is also a new email address to FIG (FIG@fig.net) since last GA.

Ian Williamson (Director FIG/UN Liaison) reported from the discussions that FIG has had with UN, including the round-table discussion in Melbourne in October, 1999. Matt Higgins represented FIG Commission 5 at that meeting. The report from the meeting is now published as FIG Publication No 22 (available in hard copy or via FIG web site).

The Bureau will, together with concerned FIG Commissions, seek to enter into bilateral agreements with international organisations such as the International Association of Geodesy (IAG). This is a follow up from the last GA when it was decided that FIG should no longer be a member of the International Union on Surveying and Mapping (IUSM) but instead seek bilateral agreements with relevant organisations. IUSM was formally disbanded at the 19th International Cartographic Conference of the International Cartographic Association (ICA) in August, 1999. Over the last two years, Jean-Marie and other officers of Commission 5 have had discussions with executive members of IAG, ICA and International Society for Photogrammetry and Remote Sensing (ISPRS) on the different roles of the organisations and how to collaborate in the future. The co-operation could be in form of co-sponsoring seminars, joint working groups etc. For more details, please see FIG Commission 5 Newsletter No 3 (on the Commission 5 web site, www.lm.se/fig5).

Tom Kennie, Chair of Task Force on Future Governance, reported on Task Force proposals to the General Assembly. A

discussion followed with many questions about the future structure and operation of the FIG Council. The Task Force will complete its work with proposal of new statutes for the GA at the 2001 Working Week. It was agreed this structural work should continue with a new Task Force to Review Commissions, Task Forces and Permanent Institutions. Tom Kennie will move on to also Chair this Task Force with Matt Higgins nominated as a member to represent ACCO.

Two bids were received for FIG Working Week 2005. These were Sydney and Cairo. It was decided by vote at the end of the week that Cairo should be responsible for the event.

Calendar for the FIG Working Weeks and Congress

- FWW 2001: 6-11 May, Seoul, South Korea
- Congress 2002: 21-26 April, Washington D.C., USA
- FWW 2003: 19-23 May, Eilat, Israel
- FWW 2004: August, Athens, Greece
- FWW 2005: April-May, Cairo, Egypt
- Congress 2006: October, Munich, Germany

ACCO

As well as work within Commissions, the Chairs and Vice Chairs of all Commissions form the Advisory Committee of Commission Officers (ACCO), which is chaired by the Vice President of the Bureau (Prof Holger Magel from the German "Shadow Bureau"). ACCO ensures consistency and co-operation across Commissions and is considered the "engine room" of FIG. Two ACCO meetings were held in Prague. Jean-Marie Becker, Matt Higgins and Mikael Lilje represented Commission 5. There was some disappointment about the meeting being too much one-way communication from the Bureau rather than ACCO acting as a think-tank on the work of the Commissions. At the end of the week mechanisms were put in

place to try and make this work better in the future.

A significant agenda item was FIG/UN co-operation. Ian Williamson joined the meeting to speak to this item. Major progress has been made and important steps need to be taken in the future to benefit from the co-operation. Some Commissions (e.g. 4, 5 and 6) have several other international partner organisations within the same field. While for other Commissions there are not many international bodies in the same field. Commission 7 on Cadastre is a good example where FIG is the only body that UN can look to for guidance. Therefore, the level of co-operation needed with UN varies among the Commissions. A concern for Commission 5 is to ensure a balance between UN co-operation and co-operation with our partner organisations such as IAG, ISPRS and ICA and for that need for balance to be recognised within FIG. On the other hand, it must also be remembered that FIG has a strategic position as the only UN recognised NGO among these partner organisations.

ACCO discussed preparations for the 2002 Congress in Washington DC with Congress Director Mary Clawson and Deputy Director John Hohol. The overall theme of the congress was decided to be *Geomatics and Property Valuation for Global Sustainable Development*. The ACSM and ASPRS will hold their normal annual congresses in parallel with the FIG XXII Congress. Practice elsewhere has been for local Congresses to yield to the FIG. ACCO expressed its concerns at this, highlighting that FIG wants a good program with a significant number of North American speakers. To guard against such problems, the calls for papers will start with the FIG Congress and FIG will have opportunity to look at the abstracts for the American Congresses. The current plans are that abstracts are to be due in April 2001 prior to Seoul. The deadline for abstracts for the US-congresses is September 2001. ACCO plans to have a meeting in Washington in

September 2001 soon after that deadline for the US-congresses so that planning of the FIG Congress sessions can be finalised. The Commissions were asked about the number of sessions they would like in Washington. The number of rooms is not limited. We are also invited to list our themes for the call for papers. Commission 5 said that its working groups could be a good start for themes and that we should also have something concerning GNSS.

There were some discussions concerning the Task Force proposal on Future Governance of FIG; especially the item concerning the ACCO member on the Council and whether that should be a voting or non-voting member. Commission 5 expressed a preference for the member to be a voting member while Commissions 1, 3 and 6 expressed the opposite view. Being a non-voting member means that it would be easier to set up the internal rules for how the person should act. There was also some discussion whether the person should be an active member of ACCO or not. Consensus was that an active member of ACCO would give best representation.

The ACCO meetings also included information from Task Forces with Iain Greenway (Standards) and Helge Onsrud (Sustainable Development) speaking on their progress. Iain expressed concern at the lack of co-operation from some Commissions while Helge asked for comments and any additional text for his Task Force's draft FIG statement on Sustainable Development. For that document, Commission 5 could have input on the role of geodetic processes, such as in monitoring of sea level rise, ice and snow melting and atmospheric changes.

FIG Commission 5 meeting and Steering Committee meeting

Commission 5 had two meetings during the week. The first meeting was an open commission meeting on the Monday

afternoon and the second was a steering committee meeting.

Open Commission meeting

We had 19 people from 5 continents at our open meeting, which was satisfying. Michel Kasser noted that many of the people attending the meeting are from Universities or Government rather than the Private Sector. This is a problem for FIG generally and it is important to remember that Private Sector Surveyors are the grass roots of FIG member organisations. Jean-Marie went through the agenda for the FWW in Prague.

Paul Cross discussed some issues that his Working Group 5.5 on Reference Frame in Practice is working with and urged everyone to help with the local fact sheets.

Jean-Marie reported that FIG has been successful regarding the simplified method on instruments. The standardisation organisations are accepting that the surveyors need a simple way to check their instruments. He also noticed that a problem within standardisation work is that the people involved often are old and perhaps not even in the business anymore. This sometimes leads to those that are active having significant influence, so that their standards can easily progress to international standards.

There was discussion on the collaboration with other organisations such as IAG, ISPRS and ICA. We need to avoid seeking collaboration for the sake of collaboration but there are many working groups within other organisations that have working groups similar to ours. The current review of IAG should be monitored as it may offer an opportunity for better formalising such collaboration.

Naser El-Sheimy spoke about preparations for the Cairo seminar on Mobile Mapping where Commission 5 intends to participate with about 10 papers. This is a joint seminar with ISPRS Com 2 and IAG Com 4.

Concerning FWW 2001 in Seoul, Matt is our main contact. We intend to have a ½ day work shop on standards and at least another 2 sessions with papers. The level of input from South Korea and other countries in the region will be a major influence on the success of our programme for the FWW.

We also discussed briefly the organisation of the Washington congress (as outlined above) including concerns about the three congresses running parallel.

Steering Committee meeting

Many of the items on the agenda to the steering committee meeting were discussed during the commission meeting, see above.

At this meeting we discussed the future governance proposals by Tom Kennie and how that would affect us. We also discussed the proposed continuation of the work into what became a new Task Force to Review Commissions, Task Forces and Permanent Institutions. Some issues discussed included: What is the future of FIG Commission 5 within FIG? Can the three technical commissions 4, 5 and 6 live separately or should they be merged?

Paul Cross reported from the Tuesday evening meeting of Working Group 5.5. Even though only 6 people attended, it is still felt important to have these meetings at Working Weeks. Paul will develop a list of action items from that meeting and continue to progress the groups work with the assistance of Matt Higgins.

We briefly discussed the program in Prague and the general opinion was that the technical program was too short if FIG wants to attract more participants to the meeting. This will be the opposite in Seoul where there seems to be no limits on how many sessions we could have.

Michel Kasser proposed as a new initiative that we should collect Commission 5 relevant papers from journals etc and in various

languages so that we can produce a "database of papers". There are so many articles in our field and a practical service to surveyors would be to collect the good ones and perhaps put them on our homepage. Of course, there is a question regarding copyright that needs to be solved. It was agreed this was a good idea and that Michel should work up a proposal on this matter.

TECHNICAL PROGRAM

This year, for the first time, all technical papers from the Working Week are on the FIG Web Site. (See www.fig.net/figtree/).

Commission 5 had a very interesting technical program in Prague as evidenced by attendance of between 40 and 60 people at our sessions. Below is an outline of the 2 sessions where Commission 5 was represented in Prague.

Sessions 2: Future Technologies, Chaired by Michel Mayoud, Commission 6.

Jaroslav Simek and Jan Kostecky: Modern Geodetic Network and Datum in Europe

Nicolas Paparoditis: Integration of techniques for digital mapping

Michel Kasser: New modern height determination techniques

Naser El-Sheimy: The multisensor technologies and their impact in the future.

Alojz Kopacik: Modern trends in the highway building in Slovakia.

Session 4: Technical standards and quality, Session chaired by Jean-Marie Becker

Hansbert Heister, Vaclav Slaboch and

Jean-Marie Becker: New technical standards improving the quality in positioning and measurement

Paul Cross: Reference Frame in practice, The role of professional, scientific, standards and commercial organisation.

Otto Heunecke and Karl-Hans Klein: Aims and activities in German standardisation respective engineering surveys.

Dennis St. Jacques: Quality in transition, a journey for Canadian Hydrographic Service.

**REPORT FROM THE MEDITERRANEAN SURVEYORS IN THE NEW
MILLENNIUM
ST. JULIENS, MALTA.
18-21 OF SEPTEMBER, 2000**

By Mikael Lilje et. al.

Introduction

FIG Commission 2, 4, 5, 6 and 7 organised a joint seminar the 18th to 21st of September, 2000 on the pleasant island of Malta. FIG Commission 5 took the lead in organising the technical program. Mr. Randolph Camilleri, head of the Land Surveyors Society of Malta, was responsible of the local arrangements. The seminar attracted more than 100 delegates from 35 countries and both the number of delegates and countries must be considered to meet all of our expectations. Among the delegates, several distinguished persons as the FIG president Mr. Robert W Foster, ICA president Prof. Bengt Rystedt, CEPLIS president Mr Bernard Bour and CLGE president Mr Paddy Prendergast. This report is prepared by Mikael Lilje, secretary FIG Commission 5 but he have had valuable help from several of the involved Commissions.

We were happy to be able to gather participants from several of the most important international organisations around the world. At this meeting we can mention FIG, IAG, ICA, CEPLIS and CLGE. The organisations had the opportunity to present their present work. There are several working fields between the different organisations and it is important that we are working in close co-operations with these and not against each other. It was also clear that the organisations need each other to be able to progress with their own tasks.

The technical program was organised in 11 sessions and one opening ceremony. All together, some 55 presentations were made.

This made the days very intense. In the evenings the local organising committee had organised social events as "Malta by night", Cocktail party and farewell dinner. The seminar was held at the Golden Tulip Vivaldi Hotel in St. Juliens.

Mr Foster commented the seminar by saying: *"I found the meeting in Malta to have been extremely well prepared and organised. The accommodations, meeting rooms, facilities and meals were all superb. The attendance was impressive and the commitment of those attending was gratifying to me as a participant in the conference. Considering the difficulties with the several languages represented there, I was pleased at how well everyone seemed to communicate, an issue especially important to myself who has the limited ability afforded by only one language. I offer my thanks and congratulations to Randolph Camilleri, Jean-Marie Becker and the other organisers of the seminar.*

But, there were considerations that we perhaps aimed for too much when trying to fulfil the needs of all the involved commissions. The result was a large number of presentations where each presentation could not be longer than about 20 minutes including the discussion. It also meant that we had to have parallel sessions during one day. We where trying to give something to the practitioners from the region but their problem was that they wanted to learn immediately and not through reading the proceedings. They mean that they do not have the time to do so afterwards. Therefore, they wanted to have longer presentations with

more discussion (more tutorial). This is probably an important lesson for the future when we are organising seminars focused on a region.

Although no specific recommendations or resolutions were developed at this Symposium, it did present an opportunity for surveyors of the Mediterranean countries to get together and discuss issues facing their surveying community. Given that the three annual FIG Working Weeks following the 2002 FIG Congress will all be held in Mediterranean countries, this Symposium was a good first step in identifying issues to be discussed at these future meetings

Opening ceremony

The seminar started with an opening ceremony that attracted the interest of media. The session included five invited speakers. These were Mr. Randolph Camilleri (Head of Land Surveyors Society - Malta), Mr. Robert Foster (FIG President), Mr. Paul Mifsud (Permanent secretary at the ministry for the environment), Mr. Georgio Boggio (EU Ambassador) and Prof Jean-Marie Becker (Chair of the technical program).

Mr. Camilleri stressed the importance of education to the development of surveying in Malta and called on the Government of Malta to support the establishment of university level courses in surveying.

Mr Foster focused his comments on globalisation and sustainable development as they pertain to the surveying profession. He emphasised the need and the importance of making local surveyors aware that they are part of a global community and stated that the surveying profession must evolve and develop in order to keep pace with the evolution and development of the world's economies through globalisation. On the topic of Sustainable Development, Mr. Foster described the FIG activities culminating with the formulation of the Bathurst Declaration in Australia. He went on to add, "the greatest

challenge to civilisation may be to achieve sustainable development. Our profession must deal successfully with the globalisation phenomenon in order to fulfil its responsibilities in the sustainable development challenge."

Technical program

The program included eleven different sessions covering the work from all the participating commissions. All the countries at the seminar were given a chance to discuss the situation in their country so that we could discuss and compare. Eleven countries accepted this opportunity. It was easy to notify that the Mediterranean region is special in the way that the northern and north-west part is the rich part and the southern part of the region (Northern Africa) is poorer. The different political systems are also of influence for the working areas of the surveyors. This means automatically that there are large differences in the surveyors role and recognition in the respective country. It was also clear that there exist subjects where the different countries are struggling with the same problems and there is something to benefit from a closer co-operation in the future. This was e.g. a remark from Mr Timoulali, Morocco at the end of the first day. He asked the participants the question *What happens after this seminar?* The countries from the Mediterranean region ended the seminar with a meeting where they decided to continue in close co-operation. Mr. Foster encourages this development, believing it will strengthen the profession in the sharing of educational developments, standardisation, and other professional concerns unique to the region.

Many items were discussed in the sessions. Mr Predergast started the seminar by discussing the work done by CLGE (the Council of European Geodetic Surveyors) concerning the study of the different education systems that exist in Europe as well as promoting the survey profession. This discussion continued throughout the seminar

since the educational system differs almost from country to country. Especially the question if the education should include practical moments as field exercises or not. Is this something that the universities should teach or is this something that the employees should be responsible of. The time at the University is limit and we should think carefully on what the students should concentrate their time with. There were presentations where we discuss the importance to always learn to be able to develop ourselves as well as our profession.

The president of ICA, Prof Rystedt presented the current structure of the organisation as well as emphasised the importance of integrated product in the future where the cartographers have an important role.

The first day concluded by a presentation from the local organising committee from FIG Working Week in Seoul.

There were several papers concerning the need to have a modern reference frame to work with. Both Netherlands and Sweden presented their ideas about changing reference frames in their countries. These presentations were introduced by a paper from Dr Altamimi, France concerning modern reference frames and their relationships and a paper concerning geoid determination in general and with emphasise to the Mediterranean area by Prof. Tzavos.

There were several papers about standardisation, both for different types of instrumental but also the importance of quality assurance in the production work.

Several papers about close-range digital photogrammetry were presented and these presentations covered both the market concerning cheaper software packages as well as examples of the use of digital photogrammetry.

Commission 4 organised two sessions concerning hydrography in Malta, the adoption of Lowest Astronomical Tide as chart datum in France and Quality Assurance in data collection activities. The second session was an open forum on education in hydrography, new technologies and sustainable development as it relates to the hydrographic profession. This session was followed by an excellent tour of the hydrographic offices in Malta.

Commission 7 organised a session of four presentation dealing with a wide range of cadastral/land management issues. Ted Schut presented a paper dealing with post and real time quality assurance of map update in the Dutch Cadastre. He outlined movement toward greater geodetic activity in the field using pen based computers.

Gerda Shennach dealt with the need for globalisation in surveying. We should encourage co-operation between national bodies and also between public and private professionals within, and outside, national borders.

Peter Dent and Zlatina Yaneva gave a joint presentation on the benefits of structured training for property professionals in valuation techniques. They were able to report on recent developments in education on land management issues drawing on current work in pre-accession countries in the eastern Mediterranean.

Bob Ashwin updated the session on developments in Land Registration in England. The people issues are often as demanding as the technical in ensuring efficient registration or cadastral systems.

The sessions were jointly chaired by Bob Ashwin and Bengt Rystedt.

The last day of presentations ended with a great variety of more technical papers. Among them, one concerning GPS-RTK by

Mr Jensen was very much appreciated where he described the techniques, the current limitations and some thoughts of what he believed could be the future within this measuring technique.

Commission meetings

Three commissions (Commissions 2, 5 and 6) decided to have separate meetings during the seminar.

Commission 5 had a meeting where we discussed the coming period up to Washington concerning seminars where we

are involved. The commission is planning to have a work shop concerning the different guidelines that we shall produce to Washington. The guidelines are about the best use of different types of instruments.

Commission 6 discussed past events and ongoing activities, and made a review of the various workshops and symposia in preparation. Regarding the next congress, all Working Groups of the Commission will start soon discussions for expressing their views and recommendations in the final report.

REPORT FROM THE 3RD INTERNATIONAL SYMPOSIUM ON MOBILE MAPPING TECHNOLOGY CAIRO, EGYPT 3-5 JANUARY 2001

By Naser El-Sheimy

Nearly six years ago, the Ohio State University hosted the first International Symposium on Mobile Mapping systems. At that time, it was very clear that Mobile Mapping had the potential for providing a diversity of services and products to the mapping community. The Second International Symposium, which took place in Bangkok, Thailand in 1999, provided further evidence – the quality and diversity of papers and the number of attendees further proved that Mobile Mapping was an area of research of its own that deserves a separate symposium. Since then, substantial progress has been made in the area of Mobile Mapping technologies, progress that would not have been anticipated six years ago.

The 3rd International Symposium on Mobile Mapping Technology was successfully held in Cairo, Egypt, January 3-5, 2001. It was co-organized by Ain Shams University, Egypt, the ISPRS Commission II (WG II.1 “Real time Mobile Mapping”), the FIG Commission 5 (WG 5.3 “Kinematic and Integrated Positioning Systems”), the IAG Special Commission IV (WG SC4.1 “Mobile Multi-Sensor Systems “), The University of

Calgary, the Egyptian Survey Authority and the Chinese National Lab for Information Engineering in Surveying, Mapping and Remote Sensing for sponsoring the symposium. The symposium was financially



supported by Ashtech-Magellan Corp. (USA/UK), Applanix Corp. (Canada), and Premier GPS Inc. (Canada).

The symposium provided a stimulating casual environment to promote scientific presentations, interactive discussions, and information exchange. It brought together 350 participants from 29 countries, who are specialists, engineers, users and those interested in mobile mapping technology, kinematic real-time positioning, sensor

integration and calibration, feature extraction and 3-D data acquisition. 90 oral presentations in 18 sessions reported most recent R&D and application achievements of mobile mapping. The proceedings of the symposium, edited by Dr. Naser El-Sheimy, have been produced in a CD and can be ordered from the Department of Geomatics Engineering, The University of Calgary (Email: Marguerite Anderson: marguerite@ensu.ucalgary.ca) or from the Survey Group at Ain Shams University (Dr. Atef Fayad: afayad@datum.com.eg).

The opening ceremony includes welcome speeches by representative of the sponsoring organizations, followed by welcome speeches by Prof. Mohamed Sheriah, the Dean of Faculty of Engineering of Ain Shams University, Prof. Hassan Ghallab, President of Ain Shams University, and Prof. Ibrahim El-Domery, the Egyptian Minister of Transportation (See Picture 1).

Prof. Gerard Lachapelle gave a very informative keynote address on “Location: A 21st Century Utility” where he described how location and navigation technology, user requirements and new applications drive each other in a never ending circle, with the users as the major beneficiaries. Gerard predicts that personal location and navigation applications will capture a large share of the location and navigation markets in the decade ahead.

Picture 1: From Left: Prof. Hassan Ghallab, President of Ain Shams University, and Prof. Ibrahim El-Domery, the Egyptian Minister of Transportation, Prof. Mohamed Sheriah, the Dean of Faculty of Engineering of Ain Shams University, Dr. Naser El-Sheimy, Convenor of the Symposium.

“The exciting technical program was complemented by a most interesting and educational social program that included a night cruise on the river Nile, a Sound and Light show at the Pyramids and individual visits to the countless historical sites of Cairo. Cairo is the oldest lived-in city in the world and is an historical treasure trove. The

Egyptians are keenly aware of their own and other cultures and were most gracious hosts” said Gerard Lachapelle

The symposium also witnesses the signing of a Memorandum of Agreement (MoA) between Ain Shams University and the University of Calgary. The MoA was signed by Prof. Gerard Lachapelle as representative of the UofC and by both the Prof. Prof. Mohamed Sheriah, the Dean of Faculty of Engineering of Ain Shams University, Prof. Hassan Ghallab, President of Ain Shams University



Picture 2: Front left: Dr. Naser El-Sheimy, Dr. Ibrahim Shaker, Prof. Jean-Marie Becker, Prof Mohamed Sheriah, Back left: Mikael Lilje, Dr. Atef Fayad, Prof. Gerard Lachapelle, Prof. Adel Hagag

The MoA will strengthen further the relationship between the two universities and encourage academic exchange between them.

The symposium was structured in such a way that features common to all Mobile Mapping Systems (MMS) were treated first before specific application, new applications, and trends in MMS were considered. Common features included the mathematical framework of direct georeferencing for land and airborne imaging sensors, kinematic positioning, object extraction and recognition, and estimation techniques common to all MMS. Only after these common features have been treated, specific sessions were dedicated to cover the full spectrum of Mobile Mapping Technology. The following highlights the major features of papers

presented at the symposium; they can be categorized as follows:

System Name / Developers ¹	Positioning			Imaging		Other Sensors
	GPS	INS	DR	CCD	VHS	
Land Systems (Van, Railway, etc.)						
GPS Van/ OSU	✓		✓	2	2	
KISS/UBW	✓	✓		2	1	
LD2000-R/UW	✓		✓	2	1	
Visimind's MMS / Visimind AB (for both land and airborne applications)	✓	*		2		*Orientation sensors
Portable MMS/UofC	✓	*		1		*Orientation sensors
VISAT - UofC/VII	✓	✓	✓	8		
Moses / UFAF	✓	✓		2	1	Pointing laser
Airborne Systems						
AIMS- OSU	✓	✓		1		
Dual Camera/ UofC	✓	✓		2		
3-linear scanner/ IFP, Stuttgart	✓	✓		3*		* line scanner
ALMIMS/ CAS	✓	✓		1*		*multi-spectral imaging scanner + LIDAR
Star-3i / Intermap Technologies Corp	✓	✓				IFSAR
DORIS / ARC	✓	✓		1		LIDAR

¹ OSU: Ohio State Univ., UFAF: University of the Federal Armed Forces, UBW: Univ. der Bundeswehr Munchen, UW: Wuhan University, AUT: Aachen Univ. of Technology, JECA: John E. & Chance, UofC: The Univ. of Calgary, ARC: Alberta Research Council, CAS: Institute of Remote Sensing Applications of Chinese Academy of Sciences

Papers on Mobile Mapping Systems:

It was very clear from the number of papers presented at the symposium that building a mobile mapping system by integrating off-the-shelf hardware and software components is getting easier, but it requires significant courage, investment and efforts. The symposium witness development activities by many universities and companies on almost all continents. Land-based systems continue to demonstrate the power promised at the early time of the development, for example in road and railway survey, utility survey and others. The takeover of the part of such traditional surveying markets is believed to be only a start. Meanwhile, the very same concept has been transferred to airborne and backpack systems where positional and orientational sensors are integrated with imaging sensors to approach real-time mapping that is not restricted to where only land vehicles can reach. The "dream" is to achieve the same level of ground position accuracy as

traditional aerial triangulation. The following table summarizes some of the characteristics of the systems presented during the symposium.

Papers on New Developments and Applications of Mobile Mapping Systems

Some of new developments and applications presented during the symposium are:

New Development

1. Helicopter Based Portable Handheld MMS for Avalanche Mapping: The system is developed by the Photogrammetric lab of the Institute of Geomatics at Swiss Federal Institute of Technology. It integrates light aerial camera and GPS/INS components to a platform that is free of the helicopter in 6 degrees of freedom. Experimental studies performed in the avalanche test site of "Vallée de la Sionne" allow determining the correct ratio between the system accuracy versus its flexibility. Experiments performed during the last two years in

"Vallée de la Sionne" avalanche test site showed that helicopter based photogrammetry is able to provide snow volume measurements with an accuracy of 20-30cm when good conditions for accurate exterior orientation and contrast are fulfilled.

2. A Portable MMS For the Survey Community: The system is developed by the Department of Geomatics Engineering at the University of Calgary. The goal of the system development is to overcome the drawbacks of current mobile mapping systems - namely their high cost, large size, and complexity - which have restricted their widespread adoption in the survey industry. The development of such a system satisfies the demand for a mobile mapping system that can compete both cost-wise and in user friendliness with current backpack GPS systems and conventional terrestrial survey systems, while realising the significant gains in efficiency typical for MMS. The system integrates a digital magnetic compass, dual-frequency GPS receiver and consumer digital camera into a multi-sensor mapping system. First system testing indicate that with three images at a 20m object-to-camera distance, absolute accuracies of under 25 cm are achieved. This is comparable to current single-frequency GPS data acquisition systems. The internal agreement of points surveyed using the system is under 10 cm.
3. Airborne Laser-ranging and Multi-spectral Imaging Mapping System (ALMIMS): The system is a multi-sensor mapping system developed by the Institute of Remote Sensing Applications of Chinese Academy of Sciences. It is integrated with multi-spectral imaging scanner, laser ranging scanner, Global Positioning System (GPS), and Inertia Navigating System (INS), all of which are tightly coupled and synchronized, insuring the pixel-level correspondence of image and laser ranging points. The result is a high-resolution multi-spectral image overlapped

with laser ranging grids at certain intervals. It can produce ortho-rectified image, digital surface model, contour map, and perspective map at near real-time without ground control points. It can be used for automatic buildings/tree extraction, and semi-automatic roads tracing.

4. DORIS (Differential Ortho-Rectification Imagery System): DORIS is an airborne multi-sensor mapping system which has been under development for years at Alberta Research Council. DORIS combines a laser-scanning technology with digital imaging technology to produce high-resolution and highly accurate ortho-rectified planimetric image map. The focus of DORIS is on acquiring data for fundamental biophysical entities of sustainable forest eco-systems and reducing the cost of the planning and conduct of forest operations.

New Applications:

1. Automatic Bald Digital Terrain Model Reconstruction from Digital Surface Data Acquired from an Airborne SAR System: Two approaches for automatic reconstruction of bald DTMs from Digital Surface Models (DSMs) are presented in this paper; namely hierarchical and non-hierarchical approaches. The non-hierarchical approach is mainly used for urban areas while the hierarchical approach is suitable to different terrain types and data with different spatial resolutions. Test results show that for the hierarchical approach the accuracy of the reconstructed bald DTM, when referenced against bald terrain surface models generated from a Lidar mapping system, is typically less than 1.25 meters RMSE in urban and low mountain areas. This is obviously an acceptable result as the accuracy of the original SAR DSM is at 1-2 meter (RMSE) level.
2. Automatic Generation of a Hierarchical DEM for Mars Rover Navigation: This paper presents techniques for the generation of a hierarchical DEM using descent and rover imagery for Mars mapping and rover localization. During a descending process of a Mars spacecraft, ten descent images may be

taken at approximately every half of the altitude. The images can be used to generate an initial DEM of the landing site. The paper proposed a further refinement technique for the DEM both in accuracy and resolution to form a five-layer hierarchical DEM, with the resolution ranging from one centimeter in the immediate area of the landing center to one meter in the boundary region about 1 km away from the center. The DEM is generated by using the hierarchical descent images with an increasing sequence of resolutions. The produced hierarchical DEM can be used for an interactive system to assist rover traverse design and for landmark extraction for automatic Mars rover localization. The authors mentioned that in future research, the rover images will also be used to expand the hierarchical DEM as the rover traverses farther from the landing center. The DEM will be refined and expanded as more new rover images become available.

3. Integrating Data From Terrestrial Mobile Mapping Systems And Aerial Imagery for Change Detection Purposes: Data fusion from different sources is one of the key problems facing the photogrammetric and computer vision research communities. In this paper, a new approach for combining data from terrestrial Mobile Mapping Systems (MMS) and aerial imagery. Road network data, captured by a MMS, is used to determine the Exterior Orientation Parameters (EOP) of an aerial image - Single Photo Resection (SPR).
4. Integrating photogrammetric data from mobile ship-borne and airborne systems for support conservation process, and environmental analysis of cost heritage along the "CinqueTerre" coast in the Gulf of Liguria region, Italy: The project is directed to emphasize the environmental heritage, on which Levanto and Bonassola base their own tourist economy, focusing the guide lines and the analysis required for the landscape insertion of the recovering project of the old railway tunnel faced to the seacoast, work over land and work over sea, through 3D virtual navigation on the gulf of Levanto and on urban centre.
5. Automatic Building extraction from airborne laser systems: This paper introduces a series of building extraction techniques in compatible with Airborne Laser-ranging and Multiple-spectral Imaging Mapping System (ALMIMS), including shadow-based method for large buildings in urban area with sparse laser ranging points, and direct laser-point segmentation method for buildings in rural area. These techniques perform well in semi-real-time, thus provide a fast data source for GIS system.
6. Integration of Mobile Phone Location Services into Intelligent GPS Vehicle Navigation Systems: GPS for position determination in vehicle navigation systems in stand alone mode works quite well only for open areas. It is obvious that in the case of obstruction of satellite-receiver visibility either position accuracy is bad or no position determination is possible. Especially in cities with high-rise buildings, satellite visibility is a very critical issue for intelligent vehicle navigation systems. Therefore GPS positioning has to be combined with other methods, e.g. dead reckoning (DR) and map matching. Apart from this, other new technologies are available nowadays which can also be employed in navigation systems. In particular, mobile phones of the next generation, the so-called 3G (Third Generation) phones, will provide the ability to determine the location of any mobile phone subscriber anywhere, anytime, with a precision required for navigation systems. Thereby different strategies for position determination can be employed. It is claimed that the position fix can be obtained with an accuracy in the order of ± 125 m using current technologies in the widespread second generation GSM network. For the use of 3G mobile phones in the UTMS network, however, an increase in accuracy for the position determination by a factor up to 10 is expected. In this paper, preliminary results on the integration of mobile phone location services for temporary position determination into the system design is investigated.

Papers on Emerging Processing Techniques for Mobile Mapping Systems

The continual development of Mobile Multi-Sensor Systems (MMS) is stimulating the development of intelligent processing techniques and new areas of application. Advanced techniques such as neural networks and snake models are currently under development to automate the measuring procedures and automatic object recognition from mobile mapping data. The two unique advantages of MMS-generated data:

- Images have unknown exterior orientation parameters, and
- The image sequences are along a known path

These two advantages make the automation of object recognition and measuring procedures more efficient and robust. The science of multiple image based matching has found its application in the mobile mapping processing. Bayesian networks have been actively researched and promise great potential for feature extraction. Real-time automation, in our opinion, remains to be the future of processing techniques for MMS. Some of the emerging processing techniques presented during the symposium are:

1. **Motion estimation by Vision for Mobile Mapping with a Motorcycle:** In this paper a vision algorithm to estimate the angular velocity of a motorcycle was introduced. This estimate, integrated with the measurements provided by other sensors such as a speedometer allows for a complete reconstruction of the trajectory followed by a motorcycle. The proposed scheme is, then, a valid alternative to the use of costly inertial platform to compensate for missing GPS data in order to geo-register information gathered by on-board sensors.
2. **Motion Tracking Framework for Mobile Appliances:** Mobile appliance, which includes hand-held and portable devices, suffers from a limitation of portable power source (battery) and a limitation of

communication bandwidth for wide area applications. This paper presents a new framework for object motion tracking. The proposed technique reduces the computational of the motion tracking algorithm as well as the number of bits that represents the object.

3. **Online GIS Module for an Unmanned Aerial Vehicle:** This paper provides an overview on how GIS could contribute to the navigation tasks of an unmanned autonomous aerial vehicle (UAV) and to the predictive capabilities required for identifying and tracking vehicles on the ground. The paper presented preliminary studies related to a project at Linköping University, Sweden. The project is an ambitious, long-term basic research project with the goal of developing technologies and functions necessary for the successful deployment of a fully autonomous UAV operating over diverse geographical terrain containing road and traffic networks.
4. **Innovative Active-Vision-Based Approach for Traffic Surveillance and Control:** ITS is an emerging global industry that capitalizes on advanced technologies to better manage the dynamic, over-congested transportation networks of today. The current ITS boom has given rise to the need for a comprehensive real-time surveillance of traffic conditions over the transportation network to allow for dynamic control and management of traffic. Existing traffic detection technologies cover a wide spectrum of technologies as well as performance, ranging from modest pavement-buried inductive loop detectors to more advanced pole-mounted off-road detectors such as microwave, radar, and camera-based detectors. All existing detector types, however, share a common limitation of being point-detectors reflecting only traffic conditions at the locations of the detectors. This paper discusses research-in-progress to develop a mobile, bus-mounted machine vision technology for transit and traffic monitoring in urban

corridors, as required by Intelligent Transportation Systems (ITS).

The technological development is still very rapid and major contribution in the area of MMS can be expected in years to come. The symposium shows a wide variety of applications including mapping, GIS, tracking, and navigation. Once different user group better understands the potential of these techniques, a further diversification of applications areas can be expected. However, continued research and commercial development of mobile mapping systems, depends on the success in implementing potential applications, creating new markets and stimulating demand for this technology.

The next International Conference on Mobile Mapping Technology will be held Kuming, China, May 25-27, 2003. For further information please contact Prof. Dr. Deren Li, Wuhan University, China, E-mail: derenli@wtusm.edu.cn or Dr. C. Vincent Tao, University of Calgary, Canada, E-mail: ctao@ucalgary.ca

**REPORT FROM IAG SYMPOSIUM ON VERTICAL REFERENCE
SYSTEM
CARTAGENA, COLOMBIA
20-23 OF FEBRUARY, 2001**

By Mikael Lilje

IAG, together with Instituto Geográfico Agustín Codazzi, organised a symposium concerning vertical reference systems in Cartagena, Colombia. The symposium was an important part of the SIRGAS work, where the countries in South America are trying to establish a regional reference system both in horizontal and vertical. The SIRGAS project has been running for several years and is co-ordinated by Prof Hermann Drewes, DGFI, Munich, Germany. The seminar attracted some 140 participants from 30 countries, mainly South America.

One very important result from the symposium was the **Cartagena Statement on Vertical Reference System**. It is quoted below:

"The International Association of Geodesy's symposium on Vertical Reference Systems, held in Cartagena, Colombia, 20-23 February 2001, adopts the following *Cartagena Statement on Vertical Reference Systems*.

Recognising that:

1. a properly defined geodetic vertical reference system is essential for,
 - An understanding of environmental (eg sea-level) change,
 - A precise and safe land, sea and air navigation,
 - Integrated spatial data infrastructure and cartographic systems,
 - Monitoring of seismic, volcanic and tectonic activity, and
 - Agriculture, engineering and cadastral applications,
2. the general availability and use of global positioning and navigation satellite systems,

such as GPS, providing worldwide positioning capability, require compability of international reference systems,

3. the international scientific, navigation and mapping communities have largely adopted a common global *horizontal* reference system in the International Terrestrial Reference Frame (ITRF), and recognising that the World Geodetic System (WGS 84) is practically identical to ITRF.

Agrees:

1. that there is an urgent need for the establishment of integrated national and regional geodetic *vertical* reference systems, with the longer term aim of establishing a unified global vertical reference system,
2. To continue to collaborate in the spirit of cooperation engendered at this symposium, by working together, as individuals and in groups, towards the achievement of this aim.

We encourage those nations not represented here to join in this collaboration, as their participation is essential to the achievement of such a goal.

We greatly appreciate the hospitality of our Colombia hosts at this excellent symposium, which has encouraged us to continue our efforts and commitment to providing the integrated geodetic vertical reference system we feel is necessary to aid future economic and social development".

Forthcoming events for FIG Commission 5

2001:

3-6 April, The Fourth Turkish-German joint Geodetic Days, Berlin, Germany. Contact: Orhan Altan, Internet: <http://www.ins.itu.edu.tr/jeodezi/fotog/tgjgd/index.html>. The main purpose of the Fourth International Symposium is to demonstrate the recent innovations in the areas of Geodesy and Surveying Engineering, GPS Applications,-Photogrammetry, Remote Sensing and Cartography,-Geo-Information Systems and-Cadastral Surveying

6-11 May, FIG Working Week, Seoul, South Korea. Contact FWW2001 Organizing Committee, Cadastral Technology Training and Research Institute, 624, Unhak-dong, Yongin-city, Kyonggi-do, Korea, Tel : +82-31-335-0851/2, Fax :+82-31-335-0853: Internet: <http://www.fww2001.or.kr> or <http://www.fig.net>

5-8 June, International symposium on kinematic systems in geodesy, geomatics and navigation (KIS 2001), Banff, Canada. Contact conference secretary: Marguerite Anderson, Tel. (403) 220-4982 marguerite@geomatics.ucalgary.ca, Internet: <http://www.ensu.ucalgary.ca/KIS2001.htm>

19-21 September, Intergeo 2001, Cologne, Germany, Contact: Fax + 49 2241 308 299, email: intergeo2001@t-online.de Internet: <http://www.intergeo.de>

1-4 October, 5th "Conference on Optical 3-D Measurement Techniques". Contact: Department of Applied and Engineering Geodesy, Institute of Geodesy and Geophysics, Vienna University of Technology, Gusshausstrasse 27-29, A-1040 Wien, AUSTRIA, Tel.: +43 / 1 / 58801 - 12804 Fax: +43 / 1 / 58801 - 12894, E-mail: o3d2001@pop.tuwien.ac.at

2-5 October, International Conference on Spatial Information for Sustainable Development Nairobi, Kenya. Joint seminar organised by FIG Commission 3, the Institution of Surveyors of Kenya ISK and UNCHS(Habitat), co/sponsored by FIG Commissions 1, 2, 5, 7, 8 and 9 and ECA. Contact: FIG Office, email: fig@fig.net.

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