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Are kites the answer for low cost aerial cover?



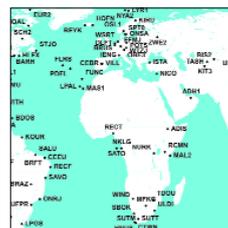
Flood plain management: a pivotal role for surveyors



Collaborating with iNSight for the future of GNSS



An alternative to network RTK? PPP v. DGNS



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#### Dates & Venues:

Wednesday 24th October  
Edinburgh Conference Centre,  
Edinburgh

Thursday 18th October  
Emirates Stadium,  
London

Thursday 25th October  
Lancashire County Cricket Club,  
Manchester



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**Editor:** Stephen Booth  
**Technical Editor:** Richard Groom  
**News Editor:** Hayley Tear  
**Advertising:** Sharon Robson  
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 Pat Collins, Richard Groom, Alan Haugh,  
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**Overseas Sources**  
 Roy Dale – New Zealand  
 Nick Day – USA

**Editorial and advertising:**  
 e-mail: editor@pvpubs.demon.co.uk  
 Web: www.pvpubs.com  
 T: +44 (0) 1438 352617  
 F: +44 (0) 1438 351989

**Mailing:** PV Publications Ltd  
 2B North Road  
 Stevenage, Hertfordshire SG1 4AT  
 United Kingdom

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**PV Publications Ltd**  
 2B North Road,  
 Stevenage, Herts SG1 4AT  
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 W: www.pvpubs.com



**COVER STORY**  
 This high resolution image of part of the roof of the Fitzwilliam Museum, Cambridge UK, was captured not by aircraft or satellite but by a kite. For more go to page 12. Image copyright Bill Blake Heritage Documentation.

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## Would you like to receive the electronic version of GW?

Many RICS members overseas receive an electronic version of GW. To receive the printed edition too overseas members must opt in. If you haven't already advised us please go to:

<http://www.pvpubs.com/OverseasRICS>

and register your requirements. Meanwhile, UK and Irish readers as well as subscribers can also receive the electronic version, which is sent at least a week ahead of the printed copy, by emailing a request to [barbara@pvpubs.demon.co.uk](mailto:barbara@pvpubs.demon.co.uk)

**Note:** the electronic version can now be downloaded as a PDF and printed.

## Next issue

The next issue of GW will be that for November / December 2012.

Copy dates are: Editorial: **8 October** Advertising: **19 October**

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## Selection and promotion: a random process?

Plenty to think about in this issue of *GW*, from kites and floods to the future of GNSS. But are we using the best promotion techniques?

There is plenty in this issue of *GW* to get readers thinking. There are new opportunities ahead as Ordnance Survey GB returns to the international scene (page 7). We show a novel technological application through using kites for aerial photography (page 12). There are lessons to be learnt and practice we could adopt in the UK from other countries (see Floodplain management in the US, page 22). And there will be exciting opportunities ahead as GNSS improves (page 16) and new techniques could offer cheaper point collection (page 18).

Also in this issue (page 11) Geomatics Professional Group chair **Stuart Edwards** discusses selection versus election within the context of members and their relationship with RICS. As I have commented before, finding people willing to become active within their profession is nearly always a struggle.

Of course it would be useful to have a lively pool of enthusiastic talent keen to step up and play their part: a talent pool from which members could be elected. Unfortunately the reality is that even within an organisation that has over 110,000 members it still requires persuasive lobbying and arm-twisting to get people to come forward. The process inevitably becomes one of selection. The problem is not confined to RICS.

For companies and organisations with employees you might think the process is easier. Your line manager or boss is the one who will almost certainly decide on whether you're ready for promotion, perhaps in consultation with one or two others. Even if a committee is involved, as often in the public sector, it will be a very small constituency of people who will select or possibly elect. More important of course than the procedure, whether election or selection, is the outcome. In the commercial sector there will be metrics to chart how successful the new appointment was. Money seems to be able to measure everything in the short term, even if we care too little about long term value and consequences.

But there is an extraordinary irony in this process uncovered by some recent research, which has found no difference in outcomes when people are selected at random for promotion! Three Italian researchers from the University of Catania in Sicily have won an

"Ig Nobel" prize (see past issues of Malcolm Draper's *Undercurrents* column for more on these awards for bizarre or odd avenues of research) for a paper submitted to the *Journal of Physics* that indeed claimed to show no difference in outcomes between selecting people at random and more conventional selection procedures. The paper relied on statistical mechanics and the "Peter Theory" which essentially says everyone will eventually be promoted beyond their level of competence, a theory first propounded, and enunciated as a law, by the late Professor **C. Northcote Parkinson**.

The area clearly needs more research but in an interesting further refinement of the idea a newspaper in Cypress reported a proposal not to choose at random those for promotion but to randomly choose those in the organisation who would make the decisions on those for promotion. Now that is interesting. More research on that one please.

Stephen Booth, Editor

### TEN YEARS AGO: GW September/October 2002

In 2002 the UK Government rejected proposals to make Ordnance Survey a Plc, as proposed in the organisation's then recent quinquennial review.

Writing in *GW* September/October that year Professor **Peter Dale** said that the review had asked the wrong questions. With some in the geomatics community demanding a scaled down OS, so that the commercial sector could reap the benefits of the growing applications of digital mapping, Dale argued this could only happen if there was a 'strong and vibrant public mapping sector' and that we all needed 'to grow the size of the cake', concluding that the industry needed a cultural change where the OS is recognised as 'a partner not a competitor'. He also advocated that the OS should be producing 3D maps, recording underground utilities and changes to building façades. Wisdom indeed.

The editor welcomes your comments and editorial contributions by e-mail: [editor@pvpubs.demon.co.uk](mailto:editor@pvpubs.demon.co.uk) or by post:  
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## Sino-UK surveying & mapping conference

The fourth Sino-UK seminar on modern surveying and mapping technology, business and management took place recently at the University of Nottingham. Attended by over 20 high ranking professional surveyors and managers from Chinese state and academic institutions as well as private companies, topics included emerging positioning and navigation technologies, the latest surveying techniques and applications, national data services, applications of GNSS for transport and future developments in geo-related practice and technologies.

**James Kavanagh**, MRICS Director Land Group, gave a keynote speech on surveying and mapping standards, specifications and the structure of RICS both in China and the rest of world. James says 'the delegation were very knowledgeable about the latest geo technologies and their application within China; they were also very interested in RICS. Not only in our industry standard geomatics guidance and output but how we also communicate these often difficult concepts to other professionals using client guides and other forms of media. The delegation was also very interested in the ethical and regulatory principles of RICS membership and keen to collaborate with our colleagues in RICS China'.

RICS has recently signed MOU's with the Chinese Society for Geodesy, Photogrammetry and Remote Sensing and the Hubei Province Society for Geodesy, Photogrammetry and Cartography and is discussing the accreditation of the world renowned centre for geomatics at Wuhan University.

## UK-Chinese Geospatial Centre

A jointly run centre for Sino-UK Geospatial Engineering has been opened at The University of Nottingham as part of the annual Sino-UK seminar (see above). The project is jointly supported by The University of Nottingham and the Chinese Academy of Surveying and Mapping. The Centre operates in both China and the UK with the Chinese arm

launched last year in Beijing, in conjunction with The University of Nottingham's Ningbo Campus.

Dr **Xiaolin Meng**, from The University of Nottingham is the UK Director, working closely with Professor **Jixian Zhang**, President of the Chinese Academy of Surveying and Mapping (CASM) and the overall director of the Sino-UK Geospatial Centre. Dr Xiaolin Meng, an associate professor at Nottingham, adds: "The Centre has set clear goals for its future development with its core mission for technology transfer. Launching the UK Centre is a milestone of our collaboration with China in the areas of geospatial science and engineering and is the culmination of lots of hard work from both sides."

## International move for OSGB

In a surprise move Ordnance Survey Great Britain has re-entered the international mapping business. Ordnance Survey International will harness its skills and expertise to support other national mapping agencies and countries. The aim is to provide expert advice and services across the full spectrum of OS's expertise, including data collection and maintenance, product development and geospatial data management.

UK Government Business Secretary **Vince Cable** adds: "Ordnance Survey has a reputation as a world leader of geographical information, developed from their strong performance as the national mapping agency for Great Britain. . . and their contribution to supporting economic growth."

Dr **Vanessa Lawrence** CB, OS director general and chief executive said: "Ordnance Survey has a depth and breadth of experience and knowledge and is internationally respected for providing Great Britain with one of the most accurate geographic frameworks of any country in the world. Within Great Britain, location-based data is recognised as a vital tool in underpinning decision making and supporting economic activity, with an estimated annual value to the British economy at more than

## RICS gamesmaker helps realise Olympic dreams



**So far GW has been an Olympics-free zone. Not through choice. We tried to get the paranoid Olympic Authority to let us publish something on the survey control but no dice. However, RICS Land Group Director James Kavanagh took on the role of a gamesmaker, one of over 50,000 volunteers to guide visitors and help with detailed arrangements.**

James was part of the Technology Team based at Greenwich Park, dealing with results distribution for all of the equestrian and modern pentathlon events. He explains: "After a hectic first week of three-day eventing and show jumping, the Olympic park at Greenwich settled down for the intensity of 'dressage' – I kid you not, these riders and their multi-million pound steeds are incredibly well trained and ice cool under pressure. With over 25,000 spectators and the assembled world press you could hear a pin drop as each of the teams went through their paces. Extended trot, piaffe, passage, canter – we all held our collective breath as Team GB claimed gold in the team and gold and bronze in the individual events – the first medals in Olympic history for the team."

"Next up was the showjumping with Team GB claiming gold and the individual showjumping with Ireland at long last getting a medal (bronze). This was particularly hectic as results tend to come quite quickly as positions change but dressage also required some intense handling as judges' scores are hand-written and medal positions can come down to tiny differences in scoring. It got quite hot in our results distribution room as myself and ten others dealt with a continuous flow of results and output."

The Modern Pentathlon is an event invented by the Olympic founding father **Baron du Coubertin** and based on the adventures of a Napoleonic cavalry officer as he/she swims, fences, rides, runs and shoots their way to freedom. Five events, one exhausting day, Mod Pen is exciting but a logistical nightmare for organisers and spectators who have to travel from venue to venue.

Competition started at 0800 at the main Olympic park and descended on Greenwich for midday. The competitors draw lots to decide on which horse (from a pool of 30 similar animals and very different from the highly prized equine athletes of dressage and three-day eventing – I could have managed one of them!), they have an hour with the horse and then into the showjumping arena. Positions can change quickly as riders barge their way around the course or even fail to finish (one poor Mexican lady fell off and one rider was disqualified after her over excited horse continued to jump out of the entire arena). Then onto the cross-country run and pistol shooting (with for the first time, lasers rather than the traditional live ammunition!). This final gruelling section is a 3km cross country run with the competitor required to shoot five targets after each lap before being able to continue. It's timed so the leader goes first with staggered start times depending on points so whoever crosses the line first wins. The last event and last medals of 2012 were awarded for the women's modern pentathlon at 18.30 or so on Sunday evening, we were there – cheering, with everyone else in the packed temporary stadium, as **Sam Murray** took silver for GB and those amazing athletes crossed the line."

"A very long emotional rollercoaster two weeks but topped by good old **Claire Balding** interviewing us all on the top of Greenwich Hill. What a team, what an experience, what a games and what a city... just signing up for Rio 2016!"

## Surveyors for a day



A school in Milton Keynes UK has won a Design, Engineer and Construct Curriculum package worth £6900. Awarded by Leica Geosystems, the annual competition aims to inspire students to be a surveyor for a day and compete to win a Class of Your Own (COYO) curriculum.

The competition was aimed at year 7 and 8 students who had to answer questions relating to sustainability and land use in their local community. The winning entry from **Hannah Gawkowska** from Shenley Brook End School stood out for her detailed research as well as her creative approach, where she used a cartoon surveyor throughout her presentation to explain supporting information. The judges also made special mention of **Matthew Bardsley**, also from Shenley Brook End School, for identifying that three out of the four presidents on Mt Rushmore being surveyors before they became presidents.

Students had to present their findings in a Powerpoint, Word or poster format. The submissions were judged on content, creativity and research by a panel including **David Price**, managing director of Leica Geosystems; **Rory Stanbridge**, Secretary General of The Survey Association and **Alison Watson**, Founder of Class of Your Own.

£100 billion."

Ordnance Survey International will be headed by **Steven Ramage**, former Executive Director at the Open Geospatial Consortium (OGC), a global body developing open geospatial standards.

## Successful launch for exactView-1

The successful launch of exactView-1, a 100kg sun synchronous polar orbit satellite, is expected to offer the highest detection performance of any commercial Automatic Identification System (AIS) satellite, according to designers and builders Surrey Satellite Technology Ltd (SSTL).

The satellite will form part of an advanced vessel monitoring constellation which will provide near real-time AIS data on the locations, speeds and routes of vessels throughout the world's oceans. The spacecraft is SSTL's 37th satellite to be launched.

## Guidance coming on light and shading

RICS is to launch a guidance note on 18th October about daylight, sunlight and shading in the design, planning and environmental impact assessment in building, development, local authority, geomatics, residential and specialist neighbour disputes.

Daylight and sunlight are important to human health and well being, affecting quality of life, working conditions, public amenity and property values and increasingly are important factors in current policies favouring substitution of fossil sources with renewable energy. This GN will not deal with rights of light, by which is meant the prescriptive and compensatable or enforceable right of light as an easement under common law. Prescriptive rights of light are dealt with in 'Rights of Light: Practical guidance for chartered surveyors in England and Wales' [1st edition, guidance note] published by RICS.

Modern technology, such as laser scanning, enables accurate, cost effective and fast analyses. These powerful tools will increasingly become the norm for evaluation of effects and

optimising outcomes. Practitioners in areas of daylighting and sunlitening will need to understand the methodologies behind these even if they use a geomatics chartered surveyor to gather and process the data.

## Shannon Survey now GeoMax distributors

Shannon Survey are now officially authorised distributors of GeoMax's products. GeoMax is part of Hexagon Group and is an internationally active company developing, manufacturing and distributing quality construction and surveying instruments.

**Marcel Goyvaerts**, dealer manager of GeoMax, visited Shannon Survey at their offices in Borehamwood, Hertfordshire in February 2012 to discuss the company becoming official distributors. After viewing the range of surveying products at this year's GEO-12 event at the Holiday Inn, London Elstree, Shannon Survey were highly impressed with the performance and the quality of the GeoMax products. For more on the GeoMax product range and Shannon Survey's services call: 020 8953 1333 or go to [www.shannonsurvey.co.uk](http://www.shannonsurvey.co.uk)

## BRIEFS

This year's Intergeo event is scheduled for 9–11 October in Hanover Germany. RICS and GW publishers PV Publications Ltd will be there to see the latest technical developments and report for readers. Intergeo is the world's biggest geospatial exhibition regularly attracting over 300 exhibitors with nearly 25% of visitors from beyond Germany. This year's show is expected to major on 3D modelling and the impact of UAV's for mapping and data capture. We invited a number of companies to tell us what they will be exhibiting and the results can be read at [www.pvpubs.com](http://www.pvpubs.com) For more about the Intergeo go to: [www.intergeo.de](http://www.intergeo.de)

**Following last year's successful Hunting lunch, which attracted 59 participants, this year's event will take place on Tuesday October 9th in Hertfordshire.**

## Take Control with LSS



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Any ex-Hunting employees who would like to attend should contact John Leatherdale [johnleatherdale@02.co.uk](mailto:johnleatherdale@02.co.uk). John is compiling a slide show featuring Hunting surveyors "then and now". Send contributions to John, with suitable captions! The cost is £30, payable on the day.

The Open Geospatial Consortium (OGC) announced that members in Australia and New Zealand, with the assistance of the Australian and New Zealand Land Information Council (ANZLIC), have launched a forum to support regional coordination and communication on geospatial standardisation activities.

Survey Solutions has won the 5th annual Leica Geosystems Football Tournament beating Stoke Paddies (aka McDermott Building and Civil Engineering) with a 5-3 victory battling it out through intermittent rain.

"Environment for Sustainability" is the theme for FIG Working Week 2013, 6-10 May in Abuja, Nigeria. Organised jointly by FIG

and the Nigerian Institution of Surveyors, a Call for Papers is announced. Abstracts for peer review must be sent by 30 September 2012; abstracts for non-peer-review by 30 November 2012. More at: <http://www.fig.net/abstractdb/submit.asp?id=18>

### PEOPLE

Chartered geomatics surveyors Charlie Matthews and Steven Strathie have joined Leica Geosystems' High Definition Surveying team as account managers.

Charlie Matthews MRICS has been involved with the survey industry since 1999, graduating from the Camborne School of Mines in 2004. Charlie has spent her post-qualification years working in the South West specialising in measured building and heritage survey work. Meanwhile, Steven Strathie MRICS gained a BSc (Hons) in Topographic Science from the University of Glasgow and has spent much of his post-qualification years working offshore and onshore in a variety of roles.

## Events Calendar 2012/13

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**KOREC Know How Events**  
September-October, Multiple Dates & Venues -see advert on page 34 or [www.korecknowhow.com/](http://www.korecknowhow.com/)

**AGI GeoCommunity '12: Sharing the Power of Place**  
18-20 September, East Midlands Conference Centre, Nottingham, UK.  
Contact: [www.agi.org.uk/geocommunity/](http://www.agi.org.uk/geocommunity/)

**Intergeo 2012**  
9-11 October, Hannover, Germany.  
Contact: [www.intergeo.de](http://www.intergeo.de)

**Leica Geosystems MyWorld Roadshow 2012**  
October, Multiple Dates & Venues.  
Contact: <http://myworldroadshow.co.uk/>

**Everything Happens Somewhere 2012**  
25 October, Friends House, 173-177 Euston Road, London, NW1 2BJ, UK.

Contact: [www.geoplace.co.uk/geoplace/link.htm?nwid=263](http://www.geoplace.co.uk/geoplace/link.htm?nwid=263)

**Trimble Dimensions 2012**  
5-7 November, Mirage Hotel, Las Vegas, Nevada, USA.  
Contact: [www.trimbledimensions.com](http://www.trimbledimensions.com)

**SPAR Europe 2012**  
12-14 November, The Hague, The Netherlands.  
Contact: [www.sparpointgroup.com/Europe/](http://www.sparpointgroup.com/Europe/)

**8th FIG Regional Conference**  
26-29 November, Montevideo, Uruguay.  
Contact: [www.fig.net/uruguay/](http://www.fig.net/uruguay/)

**European LiDAR Mapping Forum**  
4-5 December, Salzburg, Austria.  
Contact: [www.lidarmap.org/ELMF/](http://www.lidarmap.org/ELMF/)

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# Enigma unwrapped by bombe and Colossus

By Malcolm Draper

A visit to the old GCCS to view Turing's work (above) and the mighty Colossus of Bletchley.

*This wonderful and knowledgeable gentleman demonstrated Colossus to us. Inset shows paper punched tape whirling around.*

I promised readers we would try and visit Bletchley Park to learn more about **Alan Turing**, the mathematician and World War 2 code-breaking genius and computing boffin. In late August I visited Bletchley, formerly the Government Code and Cypher School (GCCS), with a close friend, the editor and **Alan Wright**. What a fantastic and exhausting day we had. I would strongly encourage anyone interested in these things to go; you may, like us, need more than a day! The good news is that your ticket also doubles as an annual season pass.

Turing is very much regarded as the father of computer science for the work he did in developing the bombe – the device that broke the German Enigma and Lorenz coding machines. At Bletchley you can see the papers he wrote before the war setting out his mathematical theories on topics I cannot even begin to understand such as "Periodicity".

Turing's contribution to the code breaking however was only part of the story. An East End boy, **Tommy Flowers**, worked for the Post Office Research Station in Dollis Hill North London. He was the engineer who designed Colossus, the world's first electronic computer which helped decipher the Germans' coded teleprinter messages. Sent as radio messages, they were captured and encrypted or simply recorded on paper by listening stations (the Y stations) and sent to Bletchley to eventually be recorded as punched tape to be run through Colossus. There is much material on Turing at Bletchley including a fine statue of Turing made of small slabs of slate by **Stephen Kettle** and commissioned by

the American philanthropist **Sidney E Frank**.

The amazing thing is that Britain ran this enormous operation at Bletchley throughout the war. At peak, nearly 9000 were employed there - mainly women - working literally round the clock seven days a week. And the Germans knew absolutely nothing about it. After the war those who worked there were barely thanked for their work and lived out their lives sworn to never reveal a word of what went on. Sadder was that Churchill ordered the destruction of the ten Colossus computers, partly to stop the Russians gaining our knowledge but also it is believed because he always felt uncomfortable about having such intimate knowledge of the enemy.

However, enough bits and pieces survived, including some drawings, for a concerted effort that began in 1990 to rebuild a Colossus and get it working. If you go to Bletchley Park today you can see it running with valves humming and flashing and the paper punch tape whizzing round. You may even be lucky and get a demo from the wonderful gentleman who showed it to us (see picture) who reminded me very much of a cross between the original "mad scientist" TV personality **Magnus Pyke** and Professor **Stanley Unwin**.

## Miscellany

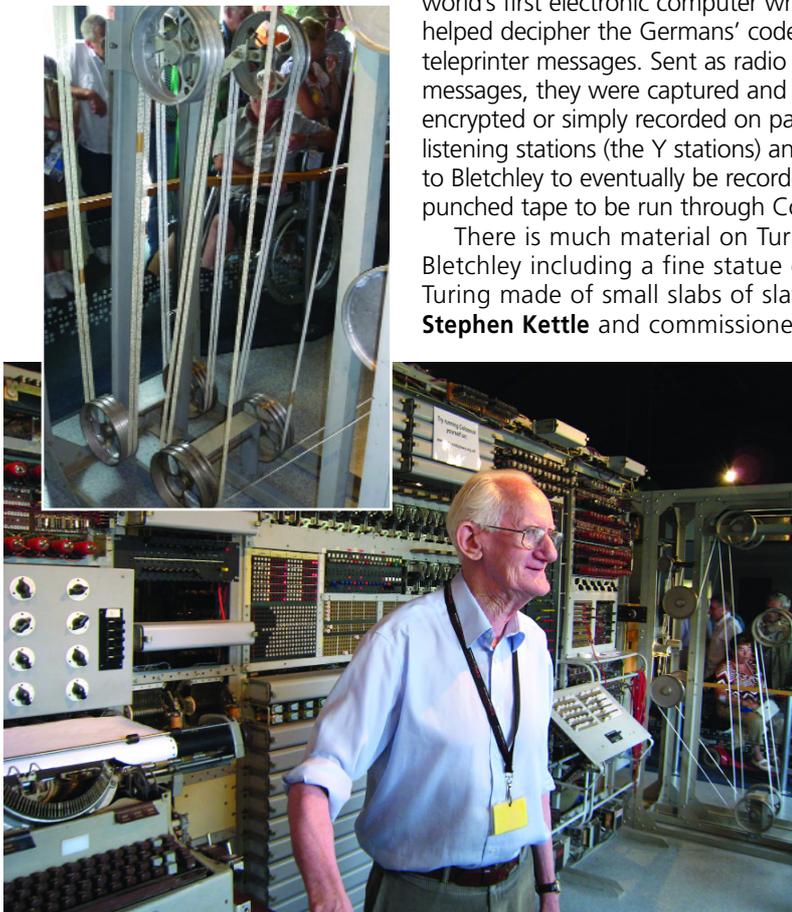
Here's an item of quirky interest from **Nigel Atkinson**, who also tells us he's looking for a Wild T3! How many pightles are there in an acre?

The correct answer is that it depends on the shape of the field. Pightles are the odd corners and strips left over at the margins when a field is ploughed. The word comes from the german "pichtel" and before that the Latin "pitellum" meaning small area or field. The German "cht" in pichtel also changed to an "x" giving "pixel" or very small thing.

\* \* \* \* \*

Here are the five rules for men to follow for a happy life that **Russell J. Larsen** had inscribed on his headstone in Logan , Utah:

1. It's important to have a woman who helps at home, cooks from time to time, cleans up, and has a job.
2. It's important to have a woman who can make you laugh.
3. It's important to have a woman who you can trust, and doesn't lie to you.
4. It's important to have a woman who is good in bed, and likes to be with you.
5. It's very, very important that these four women do not know each other or you could end up dead like me.





Election is important but it's enthusiasm and the pool from which you choose, argues **Stuart Edwards**, chair of the Geomatics Global Professional Group Board, that defines whether you will be noticed.

**Stuart Edwards**  
welcomes your comments  
and thoughts so please  
email on the following  
address  
[geochair.rics@gmail.com](mailto:geochair.rics@gmail.com)

## Team "geo" GB: striving for gold and Selection v Election!

Such is the pattern of my work that following the formal graduation of our geomatics undergraduates I try to grab a couple of weeks annual leave. This year, without any real planning on my part, my leave period coincided with the commencement of the Olympic Games and for two weeks I became, like many I suspect, addicted to the coverage, celebrating every medal almost as enthusiastically as the BBC's commentary team!

Our athletes did not disappoint, exceeding all expectations and we can all be extremely proud of finishing third overall in the medal table with a haul of 65 medals. This achievement is made all the more impressive when one considers the potential pool of athletes from which countries such as China, USA and Russia can draw.

Reflecting on this further one realises that at the root of the successes lies an immense amount of effort in training and groundwork: the 5am training starts for the likes of the 'golden' rowers, Glover and Stanning, and going that extra mile during those training runs like double gold 'mobot Farah'. At the risk of appearing a little cheesy one could, at a pinch, liken the performance of our very own Geomatics Professional Group Board to that of Team GB! We may only have a small pool from which to draw but those 'geo-athletes' working and representing our PGB are always prepared to go that extra mile to ensure that we punch above our weight on the world RICS scene.

I have mentioned previously our strong representation on the Knowledge Board and Governing Council etc., but how do we ensure we keep on attracting these 'geo-athletes' and furthermore how should we attract them in the future? Over the summer the RICS executive embarked on a review of its internal governance with a focus on how best to achieve input from its many and varied (around 18) professions. The big question it has been wrestling with is that of Selection v Election in relation to populating all of its governing bodies; and here I think much can be learned from our world class athletes and not just those who won medals.

Clearly not everyone can or wants to be a world class athlete but all those who strive to be so share a number of common traits: they wish to be the best, they have ability, they are prepared to put in the ground work to hone their skills and they hope their efforts and achievements along the way will be recognised by selectors and sponsors thus providing them with further opportunities to improve and ultimately represent their chosen sport at the highest level.

On the face of it then the selection approach might be optimal assuming we are selecting from a group of high performing 'geo-athletes' and personally I have much sympathy for such an approach but with the important caveat that ALL those who seek to get involved and can demonstrate they have clear potential must have a method of getting noticed and not simply have to wait to be noticed!

As a young graduate working in the profession, for a number of years I was blissfully unaware of RICS and what I might be able to contribute, until a colleague persuaded me to attend a local evening lecture. After this I became interested in getting further involved and put myself forward for election to the then Land Surveying Divisional Council as a Junior Representative. The important point here is that I was able to put myself forward for election based on my experience (evidenced by my CV) and didn't have to rely purely on selection. From a personal perspective then I also have sympathy for election.

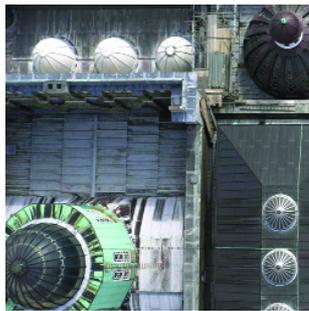
So, for our Geomatics PGB, and I believe the wider RICS, the question of selection over election or vice versa is not actually the real issue. What is vital is having a pool of potential 'athletes' who have put in the groundwork, have ability, are eager to represent their professional areas AND have a method of getting noticed. But this is just one view and perhaps you think otherwise!

As ever I welcome your comments and thoughts and any aspect of this or other GW columns, and indeed any other topic you may wish to raise, so please email on the following address: [geochair.rics@gmail.com](mailto:geochair.rics@gmail.com)

### Changing address or moving on?

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# Kite Aerial Photography: low cost aerial cover or just blowing in the wind?

By Bill Blake

Aerial images are routinely captured today by manned and unmanned aircraft and from satellites. But the technique of using a kite, although with a venerable heritage, may be a new platform for readers. **Bill Blake** is here to enlighten us.

**A**erial photos have been taken using a kite ever since 1887 when Arthur Batut took shots of his hometown of Labruguiere in France with a self-built lightweight miniature camera attached to a bowed diamond kite. He shot on sheet film negatives of his own manufacture, one at a time, with the shutter tripped by a burning fuse. He quickly adapted his technique along the lines of modern practice where the camera is suspended on the flying line below the kite and triggered by a remote device. Between now and then much has changed but Batut's method remains a standard practice in kite aerial photography (KAP). Both cameras and kites have improved since then so that today, a keen kite flyer, with a little practice, can capture striking images provided wind and light oblige.

KAP got underway in the UK when Fletcher Baden Powell took a vertical of Middleton Hall in Staffordshire in the early 1890s. Early successes were in topographic recording and archaeology. Famously George R Lawrence recorded the devastation after the fire and earthquake in San Francisco in 1905 by lifting a massive 12kg panoramic camera beneath a

train of 17 of Silas J Conye's kites. While in 1913 Henry Welcome used kite captured imagery to successfully record excavations at Segadi, Jabel Moya, Sudan with a hefty wooden box camera. Welcome began a practice which is continued to this day as KAP is a good method of capturing excavation sites in open country where the low altitude pays off in terms of image resolution at close to the scales (1:50) used in excavation records.

A kite is a good low-cost aerial platform for photography but it suffers from poor reliability in terms of accurate camera positioning on any given day. Although the number of windless

days are few in the UK wind direction has a large bearing on the outcome: getting the camera over the target area is a matter of wind direction and speed neither of which are under the control of the flier! Photography by kite therefore can be a case of shooting what can be shot rather than what is wanted. As KAP is best suited to sites with open access in a down wind direction results take patience and careful reconnaissance of obstructions in the flying zone is a must. It is often possible to achieve oblique aerial cover. But vertical cover of a given subject can be a tough call.

## Effectiveness of method

There are alternatives to a kite as a low level aerial platform (see Table 1). A balloon or powered UAV such as a radio controlled (RC) aircraft, or helicopter are all good means of raising a camera but they each have their limitations in terms of set-up costs, pilot skills, flying time and Civil Aviation Authority (CAA) certification. A kite can be a handful but it is simple, cheap and fairly easy to fly. The flying height of a kite in the UK is restricted by CAA regulation to 60m above ground level (AGL) and this is a significant constraint on photo-cover.

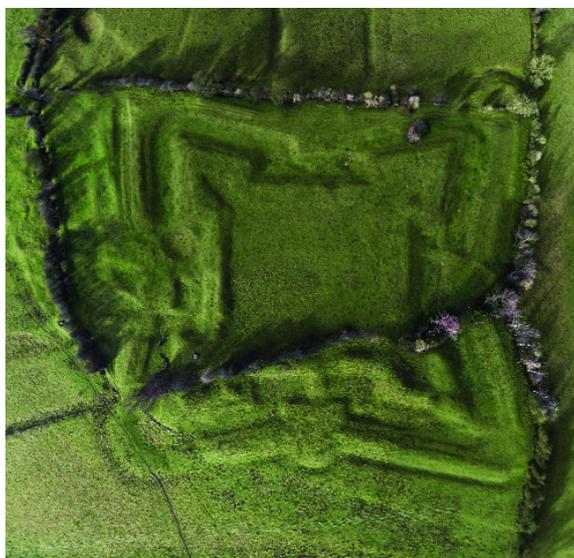
So given there's more than one way of getting a low-level aerial photo, and that managing a kite is a bit of an awkward business, why use one? The answer is two-fold. First it must be said that KAP has an immense satisfaction value for the kite flier, the achievement in the successful balance of wind, lift, light and load is special indeed. Second is the impact of the viewpoint, the world seen from the bird's eye is captivating, the low height means that human scale features like foot prints and often material condition in buildings can be seen. There is also a sense of connection between land and sky experienced by kite fliers which is very different from other aerial photographers who move at speed through the air. A kite photographer becomes immersed in the landscape whilst viewing it at bird's eye height. Tethered to both the sky and the ground a kite photographer has an awareness of landscape that is unique.

## An example of mapping coverage achieved by KAP

It is possible to use KAP imagery for survey purposes but the consistency of coverage required for good photogrammetric results can be hard to achieve. In this example a simple photomap to show the condition of the

**Fig 1** Kite aerial photo-mosaic of the Earith Bulwark, Cambridgeshire. The photography was achieved at heights varying from 15 to 60m AGL using a Leica X1 compact camera suspended from a Sutton Flowform 30 kite. The photo-scale achieved is approximately 1: 2000. The control for the mosaic is a graphical fit from the published Ordnance survey 1:25000 scale map.

Image copyright Bill Blake Heritage Documentation 2012.



monument was prepared. The coverage was captured at the permitted flying height of 60m using two cameras; a lightweight APSC format compact (Leica x1) and a DSLR with a 10.5mm lens (Nikon D5100). The kite was a Sutton Flowform 30 (2.7m<sup>2</sup>) flown in Beaufort force (Bft)3; the flying line used was a 250m length of 250DaN Dacron.

The photo-mosaic of the Civil War fort at Earith (Fig 1) was assembled from a set of 71 nadir shots of which 15 were selected for best sharpness and exposure. Reject rates in KAP can be high depending on wind conditions, shots are taken in burst mode to improve the hit rate. At a maximum of 60m flying height the nadir coverage achieved with a 35mm equivalent lens is approximately 2500m<sup>2</sup> per photo. The height of the camera varied from 15m in lull to 60m at gust, a live altimeter overlay on the video relay enabled the height to be controlled. The images are on a variety of orientations caused by manoeuvring around obstructions to the kite line; the aspect of each shot is constrained by the position of the kite, access to open ground and the available sunlight.

The coverage at 60m AGL by 10.5mm fisheye lens (shown in fig 3 corrected to perspective projection) when compared to a 35mm lens shot shows that the wider lens increases the coverage by about 3x with some reduction in resolution at the image edges, the cover achieved at 60m AGL for each image is approximately 20,000m<sup>2</sup> once the spherical distortion is removed.

**Stereo capture**

Stereo capture can be achieved by use of a stereo-metric rig or by the natural movement of the kite providing a base offset and this can be used photogrammetrically. Fig 4 shows a stereo pair processed into 3D data. Consistency of stereo cover can be difficult to achieve as the orientation of the images and separation of the base can be problematic to control with a kite.

**Cameras and rig**

In addition to an experienced flyer, KAP requires three components: a camera, the means to control it and a kite.

Because KAP can generate a lot of unwanted material digital capture is a great benefit as the image count can run on until the card is full without incurring the costs of developing film. The weight of the camera is a big consideration; in theory the load of the camera can be lifted by a kite of appropriate size but in practice the lift needed in light winds is often marginal, flying a 1.5kg DSLR requires the use of very large kites in light winds or a patient wait for a smooth Bft 4 airflow. Compact cameras weighing less than 300g work better with more manageable kite sizes. The new generation of APSC sized sensor compacts offer good resolution for their weight. Examples being the Leica

*Table 1: Low Elevational Aerial Photography (LEAP) Options*

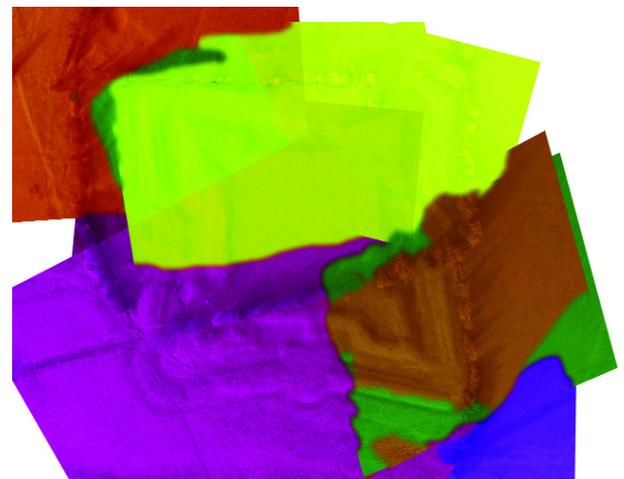
Lifter	Benefit	Approximate System Cost‡	Constraints
<b>Unmanned Aerial Vehicles (UAV)</b>			
'Hobbyist' multi rotor semi autonomous RC helicopter*	Rapid, stable, camera positioning. Low skill level operation. Up to 1kg payload.	€3,000	11 mins flight time per battery
'Professional' fixed wing drone or autonomous 'UAS' aircraft	Programmable flight path for stereo swath cover for topographic survey.	€60,000	High altitude (600m+), high flying speed. CAA certification status 'unresolved' at going to press.
'Hobbyist' Manual RC helicopter *	Rapid camera positioning	€3,000	11 mins flight time per battery. High pilot skill level required
'Hobbyist' Manual RC 'plane/Glider'	Rapid camera positioning 20-30 mins flight duration	€300	high flying speed and height required for sharp images. High pilot skill level
RC fan assisted dirigible balloon	Ideally suited to indoor flights. 20-30 mins flight duration	€5000†	Cannot operate in windy conditions. Cost of helium
<b>Un-powered tethered lifters</b>			
3m <sup>3</sup> helium balloon	Flight duration: all day if weather permits. Stable in no- wind	€300‡	Limited to 60 m cost of Helium per flight. Cannot operate in windy conditions. Clear line zone handling required.
Kite. <i>In practice a selection of 3 or 4 kites is needed to meet wind conditions between Bft 2 and Bft 4</i>	Flight duration: all day if weather permits.	€250	Limited to 60 m. Clear down wind line zone for line handling required. Weather dependant
Helikite/ kitetoon <i>A hybrid design of kite stabilised balloon</i>	Flight duration: all day if weather permits. Zero wind capacity	€2300‡	Limited to 60 m. Clear zone for line handling required. Cost of Helium per flight.

\*Professional (or exceeding 7kg in weight) use requires CAA certification  
 †including cost per filling of 3m<sup>3</sup> helium  
 ‡excluding cost of 1kg camera payload with video relay

**Fig 2** Kite aerial photo-mosaic of the Earith Bulwark.

Showing the orientation of the image components of the mosaic.

Image copyright Bill Blake Heritage Documentation 2012.



**Fig 3** Comparison of 35mm (inset) and 10.5mm lens coverage at 60m AGL. A photoscale of approximately 1:6000 is achieved with the 10.5mm lens.

Image copyright Bill Blake Heritage Documentation 2012.



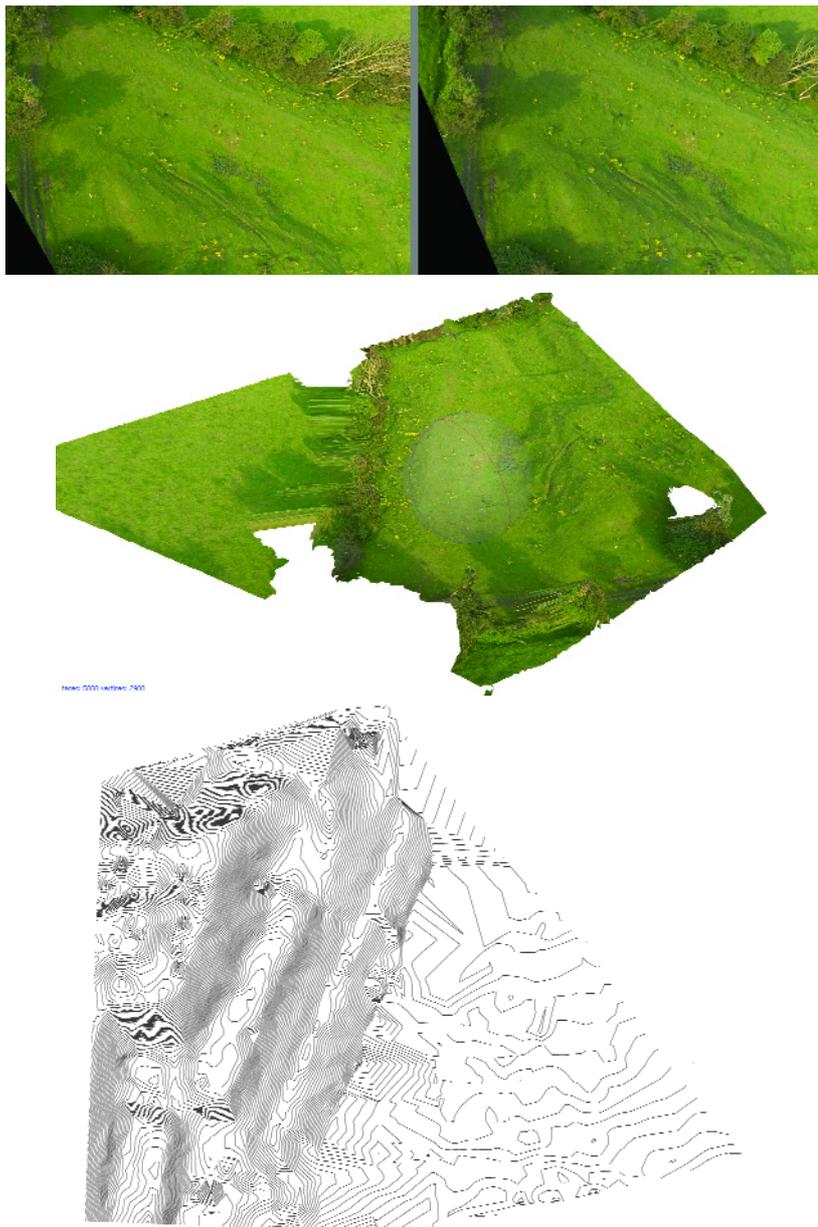


Fig 4 KAP Stereo pair, textured model and contour plan of part of the NE Bastion at Earith Bulwark Cambridgeshire. Processed in AGIsoft 'Stereo scan'. Contours generated in TheoContour by LatimerCAD.

Image copyright Bill Blake Heritage Documentation 2012

X1 (lightest in the class at 283g), FujiX100, Canon EOS M, Sony NX and Samsung Nx200.

There are two approaches to rig design: one is to automate camera control and let image capture occur at a fixed time interval (known as autoKAP); the other is to use radio control to direct the camera. Camera control is improved by use of video relay to ground and by gyro stabilisation of the tilting axis of the rig. A radio controlled KAP rig is also suitable for use mounted atop a pole or hung under a balloon where weight considerations are also important. Rigs are available in kit form or assembled in a variety of configurations from [www.kapshop.com](http://www.kapshop.com)

### Kite and line

The kite needs to be big enough to lift the load

and stable enough to take a photograph from. Not all kites behave well enough for photographic purposes; traction kites are not ideal with most kite photography being taken from single line kites. The majority of kites have quite a narrow wind range in which they will be stable; for example a kite big enough to lift a 1kg load in Bft 3 may well be at risk of either snapping its spars or being blown over in Bft 4. The quality of material and manufacture are important; a kite needs to be precisely symmetrical, flexible enough to absorb gusts and strong enough to take the forces acting upon it but at the same time light enough to create the maximum possible lift. A good KAP kite with a surface area of about 2.5m<sup>2</sup> should be capable of lifting about 1kg in about 5mph wind speed and be stable up to about 10mph. Large (3m wing span) delta kites, the classic Japanese Rokkaku and the recently developed flowform and parafoil types can be effective. Large kites (4m<sup>2</sup> is a typical light wind lifter size) can be difficult to handle and ideally a balance between the kite, the load and flier should be achieved to enable the movement of the kite and rig across the landscape. Kapper's flying heavy (DSLR) cameras tend to use a ground anchor to manage the forces involved in controlling the large kites required.

### Required weather for KAP

The quality of the airflow supporting the kite is important and smooth breezes are better than blustery. The best work is achieved in steady light winds of Bft 2 or 3. It is possible to work in higher wind speeds but the turbulence common in Bft 4 and 5 tends to make camera positioning difficult as well as creating camera movements well beyond the range of image stabilisation. The variation in wind speed between lull and gust produces a variation in flying height as well as the risk of either stalling the kite in lull or it being overblown in gust.

### KAP Applications

Applications for KAP are limited to locations which lend themselves to kite flying where good pictorial records can be captured of a site and its condition. Site context records, 1:50 and 1:100 scale site mapping, condition records of roof or parapet details are all possible. The low view-point records site context without compromising detail and often provides useful visitor orientation images of heritage sites because of the 'human scale' effect of the low height. KAP is a boon to building recording getting both 'general arrangement' shots and details hidden from the ground.

Since Arthur Batut took his first image the new technologies of ripstop nylon, high tensile Dacron line, digital image capture and radio control have made photography by kite achievable by anyone who is happy flying a kite and is ready to capture a new perspective on the world around them!

**About the author**

• Bill is a consultant surveyor on heritage matters (Bill Blake Heritage Documentation) with over 30 years experience, he is active in training metric survey skills for heritage and has been developing low cost metric techniques for site surveying and recording, including KAP, since 2009. [www.bill-blake.co.uk](http://www.bill-blake.co.uk)

**Further info:**

The principle source for information on KAP is the KAP forum hosted by Berkeley University: <http://www.arch.ced.berkeley.edu/kap/>

A good selection of archaeological KAP applications in the UK is collected by the West Lothain Archaeology group at: <http://www.armadale.org.uk/kite.htm>

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The International Group for Historic Aircraft Recovery, July 8, 2007

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*Drachen Foundation Journal Summer 2007*

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*ISPRS Commission IIFIEOS 2002 Conference Proceedings, 2002.*

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*Société d'études et de Recherches Archéologiques et Historiques de Labruguière 1999*

Christian Becot *Photographie Aérienne Avec Cerf-Volant, C. Becot, 108 Rue Médéric, 50110, Tournai, France. 1995*

Andrea Georgopoulos *Balloon and kite photography: an historical overview*  
*ISPRS Commission V ISSN 02528231 1982*

Andra Georgopolous  
*Low Altitude non metric photography using a kite*  
*ISPRS Commission V ISSN 02528231 1982*

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# iNsiGht's blue sky platform heralds future of GNSS

by Richard Groom

The iNsiGht project is a fine example of what can be achieved when researchers pool their resources by collaboration between universities working in different specialisms. Richard Groom reports on a conference to hear progress on the future for GNSS.

Around a hundred delegates from the universities, their industry and government partners and delegates from industry met for a workshop in July at the National Physical Laboratory in Teddington, West London for an update on progress on the future of GNSS.

"iNsiGht" unravels into Innovative Navigation using new GNSS SIGnals and Hybridised Technologies, so perhaps it is better to stick with iNsiGht! Prof **Terry Moore** provided an overview of the project, which commenced in 2009 and is due to complete in 2013. The objective is to extract maximum benefit from the new GNSS signals for British industry. Project management has been provided by one of the industry partners, EADS Astrium, whilst academic project management has rotated every four months between the University of Nottingham, UCL, Imperial College and the University of Westminster.

Each satellite constellation has its own reference frame so, starting with space vehicles, Prof **Marek Ziebart** from UCL explained how the orbit parameters for each constellation are derived and how they can be related. The answer is that they are observed from tracking stations, but these move due to plate tectonics. The coordinates of the tracking stations are also closely guarded secrets, so Ziebart's team has set about deriving seven parameter transformations between the constellation reference frames by comparing precise orbit data for GPS satellites with the broadcast orbit data for Glonass satellites every day over four years. The results showed up anomalies, indicating, surprisingly (and possibly alarmingly), that the reference frames are indeed not static.

## Ionosphere and troposphere

Data from dual-frequency receivers can be used to determine the first term in the equation that describes ionospheric delay. Dr **Chris Hill** from the University of Nottingham said that, with additional signals, it will be possible to compute the second and third smaller terms which are currently ignored.

Ionospheric scintillation causes cycle slips and loss of lock. Hitherto, mitigation methods do not deal with severe ionospheric conditions but Hill's researchers are able to measure the disturbance and found that if observations are weighted there is a 40% lower RMS error.

Temperature, pressure and humidity all affect the

refraction of GNSS signals in the troposphere but they are difficult to model due to rapid changes in water vapour. Common practice has been to use standard models which do not make use of actual measurements and assume that refraction is symmetrical around the observing station. For RTK, the assumption is that tropospheric effects are the same at the base and the rover, whilst for network RTK the network is analysed to produce a tropospheric model and for precise point positioning (PPP) a 'blind model' is used to estimate tropospheric corrections, which are then applied as a scale factor. To improve on this, the researchers have developed a ray tracing method which makes use of the UK Met Office's MetUM model covering the North Atlantic and Europe to calculate refraction as the signals from each satellite pass through the troposphere. The model is gridded at 12km intervals, has 15 layers up to 20km above the Earth's surface and is refreshed every six hours. This refresh period is too long, but there is the possibility of using observations from the CORS (continuously operating reference stations) in OS Net to compute real-time models.

## Multipath or NLOS

Moving closer to the ground, **Paul Groves** (UCL) presented the results of research on multipath. Firstly, there is a need to distinguish between 'multipath' in which the direct ray is received at the antenna but with additional reflected signals and 'non line of sight' (NLOS) signals, when there is no direct signal received – only reflections. With more satellites and more signals, the objective is to identify multipath and NLOS signals and eliminate them from the solution. Helpfully, GNSS signals are right-hand circular polarised, which become left-hand polarised if they are reflected and, of course, right-hand polarised again if they are reflected twice.

One output from iNsiGht is the idea of using dual polarisation antenna systems to help detect multipath and NLOS signals. The second area of research is consistency checking: if you know that you cannot receive a direct signal at the antenna from a specific satellite because, for example, there is a building blocking the line of sight, any signal received at the antenna from that satellite must therefore have been reflected. A city model could potentially be used to identify the NLOS signals.

**Receiver electronics:** The project includes contributions from the electronics experts and Prof **Izzet Kale** from the University of Westminster described the next generation dual-polarisation receiver. This is a highly specialised area where the links that have been forged with the geomatics researchers via iNsiGht have been particularly fruitful. One point

*The workshop brought together experts across the broad field of satellite navigation.*



made was that more accurate and predictable clocks will influence the future. This was a point reinforced later in the day in the context of PPP because passive hydrogen maser clocks will improve the prediction of satellite clock errors – an essential if we are to have real-time PPP.

Prof **Washington Ochieng** from Imperial College, London has been looking at applications. GNSS is moving into areas where safety of life is an issue. For these critical applications it will be essential for the user to be told in good time when things are going wrong and has reliable performance indicators.

**Chris Hide** (University of Nottingham) explained how more satellites will improve availability, bring better modelling of the troposphere, better integrity and faster convergence but will not necessarily improve DOP (dilution of precision). More frequencies will improve ionospheric corrections and also bring faster convergence.

**Peter Bagnall** works for STMicroelectronics, which manufactures chips for navigation devices. He dreams of ubiquitous positioning, but meanwhile sees advantage in the new constellations through removing the single point of failure, which was inherent with GPS – weak signals and limited accuracy. In two to three years Bagnall predicts that all new receivers will receive all of the new signals.

Finally, **Colin Fane** from the Ordnance Survey

described how the OS currently uses GNSS and discussed the benefits arising from the recent NetRTK2 report (see *GW* July/August 2012).

Discussion found that power consumption is a major concern: it will increase with the addition of new components but will then continue falling. End users expect ubiquitous positioning (not part of the project but clearly the next big challenge). The E5AB wide band width could improve precision and has potential for giving sub-decimetre code solutions. Network RTK and precise point positioning will compete but the consensus was that PPP will ultimately be the stronger technology and should predominate in ten years time. The main beneficiaries from the new constellations and signals will be air and land transport. And finally, will the new signals be seen as ‘just another photocopier’? Indeed, should we now be selling satellite navigation and positioning as “GNSS” or should we stick with the now incorrect but familiar term “GPS”?

Summing up, **Marek Ziebart** stressed the value of working together between disciplines and universities for the greater good and praised the early influence of Prof **Paul Cross**. inSight has created a critical mass by combining the knowledge of a diverse group of researchers to create a “blue sky platform” for industry. He urged universities and industry to continue to work together and take advantage of the opportunities afforded by their collaboration.

*“...initialisation within two seconds...”*

*“...the reference frames are not static.”*

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# PPP versus DGNSS

By Chris Rizos, Volker Janssen, Craig Roberts and Thomas Grinter

Is precise point positioning (PPP) a viable alternative to differential GNSS (DGNSS) techniques? In this article we look at the current status of PPP and its potential.

PPP is a GNSS survey method that employs readily available satellite orbit and clock correction data to perform absolute positioning using measurements from a single GNSS receiver. This is an advantage over differential GNSS positioning methods, which require simultaneously observed pseudo-range and carrier-phase data from one or more reference stations with known coordinates. But PPP also comes with a number of severe disadvantages, the most significant being the long time necessary for the ambiguity float solution to converge in order to ensure centimetre-level positioning accuracy. This has limited its use for real-time applications.

receivers for the densification of the ITRF datum, or of static receivers in the context of earthquake studies (for determining pre-, co- and post-seismic motion), and estimation of tropospheric delay – its use as an alternative positioning technique to DGNSS for surveying and mapping applications has been limited. This can be attributed to several reasons.

Firstly, with the advent of cost-effective, centimetre-level accuracy, GNSS-RTK (“real-time kinematic”) positioning provided by an increasing number of continuously operating reference station (CORS) networks around the world, there has been little need for PPP – a technique that does not (directly) use CORS services. Secondly, the availability of satellite orbit and clock error information could, until recently, only support decimetre-level accuracy PPP via post-processed coordinate solutions. Thirdly, the RTCM message and data product standards to support PPP positioning are comparatively immature. Fourthly, no commercial off-the-shelf GNSS receivers have been marketed that have the capability to generate positioning solutions using the PPP method in real-time.

Nevertheless, the post-processed PPP technique can be considered a useful “fill-in” service for existing regional CORS networks in areas where dense CORS coverage is not justified due to low population density, or for economic reasons (such as in developing countries), or operational constraints (such as offshore positioning). In these situations, free PPP post-processing services such as Auto-GIPSY (<http://apps.gdgps.net/>) and CSRS-PPP ([http://www.geod.nrcan.gc.ca/products-produits/ppp\\_e.php](http://www.geod.nrcan.gc.ca/products-produits/ppp_e.php)) provide converged float solutions at the centimetre-level, making PPP a viable alternative to post-processed DGNSS solutions. Note, however, that long observation session times (up to several hours) are required. There are a number of downloadable PPP software packages that are capable of post-processing GPS (and in some cases GLONASS) data files. One of these is RTKLIB, a well known open source package (<http://gpspp.sakura.ne.jp/rtklib/rtklib.htm>).

## Real-time issues

Operating in real-time is far more challenging than in post-processed mode. The critical issues are timely availability of measurement (and other) data over a wireless communications link, in an industry standard format that would allow GNSS receivers to operate reliably with minimum constraints and with comparative ease.

In conventional PPP (real-time or post-processed modes) the only raw pseudo-range

Correction Type	PPP	Differential GNSS
<b>Satellite Specific errors</b>		
Precise satellite clock corrections	✓	✗
Satellite antenna phase centre offset	✓	✓
Satellite antenna phase centre variations	✓	✓
Precise satellite orbits	✓	✓/✗
Group delay differential	✓ (L1 only)	✗
Relativity term	✓	✗
Satellite antenna phase wind-up error	✓	✗
<b>Receiver Specific Errors</b>		
Receiver antenna phase centre offset	✓	✓
Receiver antenna phase centre variations	✓	✓
Receiver antenna phase wind-up	✓	✗
<b>Geophysical Models</b>		
Solid earth tide displacements	✓	✗
Ocean loading	✓	✗
Polar tides	✓	✗
Plate tectonic motion	✓	✗
<b>Atmospheric Modelling</b>		
Troposphere delay	✓	✓
Ionosphere delay	✓ (L1 only)	✗

**Table 1:** A comparison between the measurement biases and errors that need to be applied or accounted for in typical PPP and DGNSS positioning techniques.

## A global reference frame

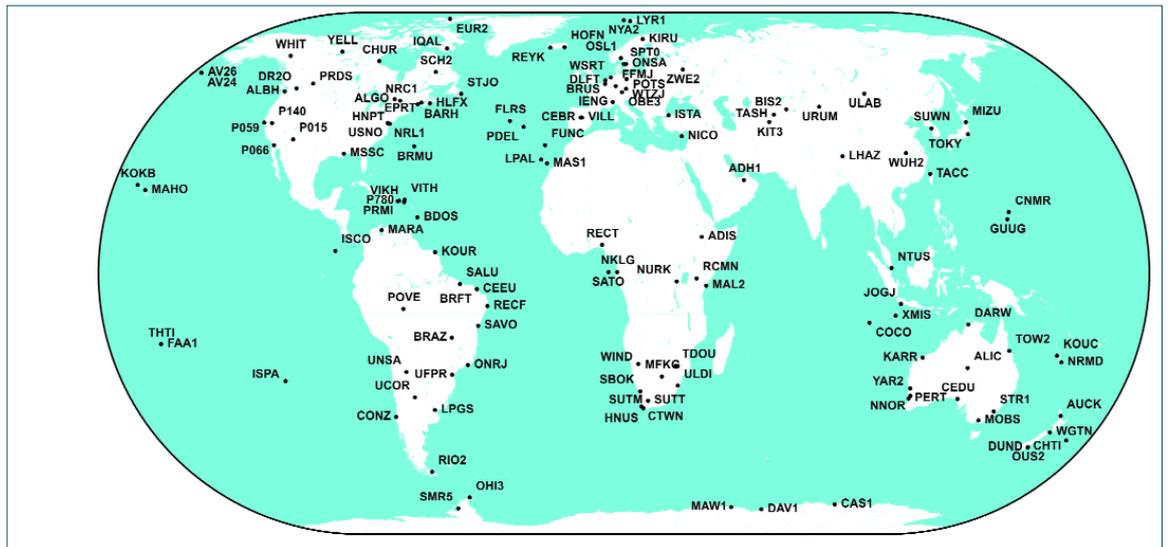
PPP provides a positioning solution in a global reference frame such as the International Terrestrial Reference Frame (ITRF), free of datum inconsistencies associated with differential positioning techniques based on nearby reference stations with coordinates expressed in a national datum (e.g. GDA94 or ETRF2000). However, PPP comes with its own set of issues. Factors like tectonic plate motion and solid earth tides have to be considered (see Table 1), as well as several other special corrections to observations, and it is important to fully understand the implications of transforming between a global and a national or local datum.

## PPP in mainstream surveying

While post-processed PPP has many applications in geodesy – such as determination of the coordinates of

The real time IGS network.  
Image:

 2011 Oct 14 17:42:15



and carrier-phase measurement data required is that of the user's own receiver. However, for real-time results, sub-decimetre satellite orbit information and sub-nanosecond accuracy satellite clock correction information must be available in real time (or with very low latency, perhaps no more than several seconds delay) at the user receiver. This is a significant impost, both in terms of the provision of real-time satellite system data, and the wireless communications to access such data products. On the other hand, calculation of the orbit and clock data products requires a relatively sparse ground reference station infrastructure and the data analysis capability can be centralised at a few computational facilities with the relevant expertise, and then broadcast to users.

The International GNSS Service (IGS) Real Time Working Group has been investigating the issues associated with real-time CORS infrastructure and data products, and has been running a Pilot Project for the past two years (<http://www.rtigs.net>). The IGS will launch a Real-Time Service (IGS-RTS) in the latter half of 2012. However, there are a number of issues that must be addressed for real-time PPP were it to be based on the IGS-RTS, not the least of which are: (a) the mode of distribution or broadcast of the real-time orbit and clock data products, and (b) the format for such data messages. To encourage user uptake of real-time PPP the provision of IGS-RTS products on its own is not a sufficient condition. An important condition is that instrument manufacturers must implement real-time PPP algorithms inside GNSS receivers. This is generally presaged by the development of appropriate RTCM standards for the broadcast of precise satellite orbit and clock error information.

Note that although the IGS predicted orbits are accurate enough for decimetre-level PPP (by assuming that the "ultra-rapid (predicted)" products have been downloaded hours in advance and are available for use by the receiver/computer as the instant measurements

are made, i.e. in "real-time"), the predictability of the satellite clock corrections is relatively poor (see Table 2). A real-time PPP service would require an order of magnitude improvement in the quality of satellite clock estimates by effectively shortening the time between measurements being made by the PPP service provider's CORSs, transfer of data to an analysis centre where the clock correction parameters are estimated, and then dissemination to real-time PPP users.

**Trimble RTX**

In an interesting recent development a new commercial real-time positioning product known as "Trimble RTX" has been released in the US, claiming to bridge the "gap" between real-time PPP and Network RTK (NRTK) GNSS. A global CORS network (similar to the IGS's) allows for the computation of precise satellite orbits and clock corrections, while a regional CORS network is used to determine local atmospheric measurement delay corrections. It is claimed that this technique is capable of providing real-time positioning at the 4-centimetre level horizontally (95%), with initialisation times of less than one minute. The necessary satellite orbit and clock correction information are broadcast by an L-band satellite downlink from a geostationary satellite, similar to the use of SBAS satellites for wide-area

*"A real-time PPP service would require an order of magnitude improvement in the quality of satellite clock estimates..."*

Product	Parameter	Accuracy	Latency
Ultra Rapid (predicted)	Orbit	10 cm	Real Time
	Clock	~ 5 ns	
Ultra Rapid (estimated)	Orbit	< 5 cm	3 hrs
	Clock	~0.2 ns	
Rapid (estimated)	Orbit	< 5 cm	17 hrs
	Clock	0.1 ns	
Final (estimated)	Orbit	< 5 cm	~ 14 days

**Table 2:** Precise GPS satellite orbits and clock corrections provided by the IGS (<http://igs.org/components/prods.html>.)

GNSS. This has the distinct advantage of complete coverage, as opposed to real-time DGNSS which can be hampered by radio or mobile telephony communications of variable signal quality and patchy reception. No doubt similar commercial products will be shortly available from other GNSS user equipment manufacturers and/or service providers.

### More satellites

The ability to utilise extra satellites available in the GLONASS constellation enhances the capabilities of PPP and its possible applications. Currently four IGS analysis centres routinely provide GLONASS precise orbit products. The independent GLONASS orbits are of 10-15 cm level accuracy, and orbits from the four organisations are combined to generate the IGS final GLONASS orbit data products. Only two data analysis centres provide GLONASS clock data, accurate at the 1.5 ns accuracy level, at 5-minute intervals. Since this temporal density is not sufficient for most kinematic PPP applications, interpolation of the satellite clock corrections is necessary.

### M-GEX

The Galileo and Beidou constellations are currently being deployed. The IGS has launched a new initiative, the "Multi-GNSS Experiment" or M-GEX (see Call for Participation at: [ftp://igs.org/pub/resource/pubs/IGS\\_M-GEX\\_VF.pdf](ftp://igs.org/pub/resource/pubs/IGS_M-GEX_VF.pdf)), that will, in the first instance, establish a global tracking network of multi-GNSS capable tracking receivers. M-GEX also seeks to encourage the analysis of the M-GEX data in order for IGS analysis centres to gain valuable experience in computing satellite orbits and clock correction information for all GNSS constellations. However, it is still too early to confidently predict the full benefits of multiple GNSS constellations – where over 100 satellites broadcast up to four times that number of signals on which pseudo-range and carrier-phase measurements can be made – for precise positioning users.

### More frequencies

The Galileo constellation, once fully operational, will broadcast signals in three frequency bands. China's Beidou will also transmit on a minimum of three frequencies. More satellites and more frequencies means more pseudo-range and carrier-phase measurements can be made by a suitably configured user receiver. This is expected to enhance integer ambiguity resolution for PPP, i.e. increase reliability and decrease the required time length of observations. However, there is no 100% interoperability between the four GNSS constellations on three frequencies (i.e. it is not possible to mix pseudo-range or carrier-phase measurements from GPS, GLONASS, Galileo and Beidou in triple-frequency combinations). Nevertheless one would expect

that the widespread availability of triple-frequency GNSS signals by the end of the decade will significantly speed up ambiguity resolution for both PPP and DGNSS techniques.

### Fixing integer ambiguities

The fixing of integer ambiguities is usually only applied to double-difference processing algorithms, as all unknown non-integer biases are eliminated or significantly mitigated in such a measurement differencing process. Although the fixing of integer ambiguities is a particularly difficult challenge for the undifferenced measurement processing used by PPP, several methods have been developed to improve the reliability of ambiguity resolution.

However, challenges still remain, primarily reducing initialisation times and correctly accounting for the ionospheric delay in the GNSS measurements. It is unlikely that a PPP solution, using a global or wide-area CORS network, will ever become as effective as short-/medium-baseline GNSS-RTK or GNSS-NRTK due to the difficulty in providing sufficiently accurate ionospheric corrections. A regional CORS network with inter-receiver spacing of the order of a "few" hundred kilometres (and preferably much less), however, has the potential to significantly improve the modelling of the spatial variability of the ionospheric delay bias in GNSS measurements.

### PPP for the toolbox

"High performance" (i.e. high accuracy, and high productivity – short periods of observations) real-time PPP has been demonstrated, both in a commercial sense (Trimble's RTX) and by academic researchers. However, the current dependence of real-time PPP techniques on the same CORS networks that are used to deliver DGNSS, including NRTK, means that implementation of real-time PPP depends upon a technology solution that already delivers the same positioning capability as real-time PPP would provide (confusingly such CORS-augmented PPP techniques are referred to as "PPP-RTK"). Because the need for CORS networks will not disappear, it seems that, while PPP will be a useful addition to the GNSS "toolbox", DGNSS-based techniques and services will still be a popular user option for many years to come. The justification for the establishment of CORS by government agencies and the private sector has certainly not been weakened by recent developments in PPP-RTK.

### Acknowledgements

**Richard Groom** is gratefully acknowledged for his editing of a paper delivered by the authors at the FIG Working Week in Rome on May 9, 2012 entitled "Precise Point Positioning: Is the era of differential GNSS positioning drawing to an end?". To see the original paper and full references, visit: <http://www.fig.net/pub/fig2012/techprog.htm>.

*“.. there is no 100% interoperability between the four GNSS constellations on three frequencies..”*

### About the authors

**Chris Rizos** is the Head of the School of Surveying and Geospatial Engineering at the University of New South Wales (UNSW) in Sydney, Australia and is the current President of the International Association of Geodesy.

**Volker Janssen** is a GNSS Surveyor (CORS Network) in the Survey Infrastructure and Geodesy branch at NSW Land and Property Information in Bathurst, Australia.

**Craig Roberts** is a Senior Lecturer in Surveying/GPS/Geodesy at UNSW, Sydney, Australia.

**Thomas Grinter** is a Technical Surveyor in the Survey Infrastructure and Geodesy branch at NSW Land and Property Information in Bathurst, Australia.



Leica's HDS event at Blenheim Palace drew a crowd of nearly 100 to hear the latest developments, a presentation from **Doug Pritchard** (above) and to vote for the annual awards. *GW* reports.

*What does the odd little collection of objects below have to do with HDS? They were all captured in high detail by scanning and then printed (yes, "printed") using a 3D printer by specialists EuroPac.*



## Symposium rewards innovation

**W**ith the Olympic success Britain seems to be punching way above its weight at the moment. At Leica Geosystems' 2012 HDS user symposium further evidence came from **John Fraser** (now regional director for northern Europe) that although HDS sales only account for 15% of Leica's turnover, nearly half (45%) come from the UK. This means when UK users submit a wishlist of improvements and changes the company takes note. Get your thinking caps on guys and gals.

The symposium, held in the sumptuous location of Blenheim Palace, was an opportunity to hear about developments in High Definition Scanning (HDS) including Leica's partners. It was also a chance to get feedback from users and for an awards lunch, of which more anon.

**Tobias Maier** from the company's headquarters in Switzerland, introduced an option for the C5 and C10 scanners: a Canon SLR camera. This is a high resolution 18 Mpx Canon EOS 60D SLR with a fisheye lens. A mounting kit includes a bracket that attaches to the scanner's carry handle slot and a USB cable for image transfer. The addition means a much wider field of view is available to the user rather than the scanner's onboard camera, which is governed by the 260° scan field of view. This set up is not the prettiest of solutions but will presumably serve as a stopgap until a high resolution camera is incorporated in the next generation of scanners.

Users also heard about the latest software updates for Leica's Cyclone, Cloudworx and fellow Hexagon company Technodigit's 3D Reshaper. The latter adds meshing, smoothing and CAD extraction but keeps curved detail when meshing. In places where there is no point cloud data Cyclone 7.4 has a "Gradient Display" option so users can add graded background colours, such as blues for sky or browns for the ground, to give a more realistic view.

Leica CloudWorx for Revit is a plug-in for CAD and VR modelling software. It offers a faster way to create accurate BIM deliverables of existing buildings based on laser-scan data

for Autodesk's Revit users. The plug-in includes many of the same features that exist in CloudWorx for AutoCAD.

A company *GW* had not come across before is EuroPac. They specialise in very close-range scanning and metrology and can output scanned objects to a 3D printer. MD **John Beckett** showed an image of a highly detailed Chieftain tank, scanned mainly with the C10 but with fine detail filled in by using a close-range handheld scanner. Another object, a statue of a lion and a cockerel, could be checked easily against the original: it guards one of the many entrances to Blenheim.

But perhaps the most impressive scanning ever seen by your reporter was of the free-flowing statue that stands atop the entrance to Lloyds Bank in Leeds. The bank's black horse was sculpted by **Peter Tysoe** back in 1976 using steel rebar. It stands in front of a great slab of granite and is approximately 15 ft by 17 ft long. To scan it, the road was closed overnight and fine detail within the frame was picked up with handheld scanners. Once captured, a beautiful accurate 3D model of the statue was produced. . . for the bank's chairman. Oh well, it's better than speculative financial derivatives.

The event was rounded off with the awards preceded by a presentation from **Doug Pritchard** of the Glasgow School of Art and a director of CyArk Foundation. He introduced the Scottish Ten Project, which seeks to capture by scanning five significant historical or archaeological sites in Scotland and the same number around the world of which their scanning of the Mount Rushmore monument of America's founding presidents is the most significant. Completed in time for 4 July this year, the project attracted widespread media coverage in the US and beyond.

Attendees had the chance of voting for the Innovation Award from seven projects. By a substantial majority voting went to Star Net Geomatics' project with Talisman Energy (UK) Ltd that trialled scanning a subsea spool piece in the North Sea. The aim was to derive precise dimensions between two flange faces on adjacent manifolds to fabricate a spool piece.

The combination of laser (HDS6100) and sonar scanning (BlueView BV5000) technology, coupled with Star Net's data processing techniques utilising Leica Cyclone software, provided a unique and innovative solution, which has resulted in the award of a framework agreement with Talisman Energy for future projects. *GW* hopes to bring you more on this interesting project in a future issue.

• *Our thanks to Leica Geosystems for an interesting and enjoyable day at a spectacular venue.*

# Floodplain management in the United States

by Wendy Lathrop

Human settlements are likely to see a lot more flooding in coming years. Those who live in flood risk areas can do much to mitigate potential damage as well as getting reduced insurance premiums. **Wendy Lathrop**, a licensed land surveyor explains the situation in the US and the surveyor's pivotal role.

*Severe storms and flooding at Nashville, Tennessee on May 4, 2010 David Fine/FEMA*



Since the earliest days of settlement in the United States, human response to water has been to try to control it in order to “reclaim” land. Protection against flooding was generally limited to structural methods of floodplain management, building flood-control works such as dams, levees, or sea walls. Early in the 20th century, this method was supplemented by providing disaster relief to flood victims.

Such practices however neither reduced losses nor discouraged unwise development. In some instances, they may have actually encouraged additional development. Further, flood coverage from insurance companies was either exorbitantly expensive or not available (the insurance industry found such policies were not good investments), while building construction rarely included techniques to reduce flood damage.

After widespread destruction along the eastern seaboard and Gulf of Mexico in the 1950s and 1960s from a series of devastating hurricanes, Congress acknowledged the immense economic impact of flood damages on individuals, farming, and other businesses. Recommendations for a unified national programme for managing flood losses<sup>1</sup> finally culminated in passage of the 1968 National Flood Insurance Act<sup>2</sup>, which required mapping of flood-prone areas and set up a system of federally-backed insurance policies available in communities meeting minimum floodplain management requirements established by the managing federal agency.

This was the birth of the National Flood

Insurance Program (NFIP), currently administered by the Federal Emergency Management Agency (FEMA). The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection. By creating a national pool of insureds, premiums would be kept low, and ideally the programme would be self-sustaining in terms of paying out when disaster did strike. (The quantity and immensity of recent flooding events has, however, overwhelmed the system and required additional disaster recovery appropriations from Congress.)

Later legislation augmented the NFIP by allowing federal or federally related loans only on properly insured properties within flood prone areas, limiting federal insurance payouts on repeatedly damaged structures, and establishing rules for local community floodplain management. Properties in communities not participating in the NFIP are prohibited from federal flood insurance coverage; participating communities are those that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.

## How the NFIP works

Because any surplus amount of water beyond human preferences can be perceived as a flood, for regulatory purposes a particular probability of flood risk has been established as the basis for land use rules and calculation of flood insurance premiums. In the United States, that basis is the 1%-annual chance flood event. Floods with other frequencies are calculated for land development and public safety reasons, such as 0.2%-, 2%-, and 10%-annual chance flood events.

The NFIP strives to reduce the exposure to flood damages through the use of minimum standards for the placement and design of structures located in 1%-annual chance flood hazard areas. The three primary components of the programme are therefore, mapping (identifying the flood hazard areas), a standard framework for regulations (setting national minimum standards for land use in identified 1%-annual chance floodplains), and insurance made available through the federal programme only in communities participating in the NFIP, with rates based upon the mapped identified flood risks, construction before or after identification of

those risks, and height of the structure above or below the identified estimated water surface elevation during the 1%-annual chance flood event, termed the Base Flood Elevation.

### Mapping

Identifying the risk and hazard zone in which a given structure is located is integral to the functions of the insurance and land use regulatory aspects of the NFIP. Lenders must verify flood zone designations for structures serving as collateral on loans. For any such structures located within a 1%-annual chance floodplain, government-regulated lenders are legally required to impose the mandatory flood insurance purchase requirements that were first introduced by the 1973 Flood Disaster Protection Act.

Insurance rates are based upon the level of risk to the structure as first identified by the mapped flood risk zone and then, if within the regulated floodplain, by how far above or below the identified Base Flood Elevation (BFE) the lowest floor or lowest structural member of the building is situated. In riverine flood hazard zones, the elevation of the lowest floor of the structure, including the basement, is compared to the BFE to determine the risk to the overall building. Within areas subject to storm surge in coastal zones, it is the lowest structural member of the building that is compared to the BFE in order to determine rates. For instance, a home on pilings must have the lowest crossbeam at or above BFE for lowest premiums. In both types of zones, any machinery or equipment servicing the building must also be elevated for the most affordable insurance rates. Determining if a structure is in or out of a flood hazard area is based on lowest adjacent grade comparison to BFE on natural ground or lowest floor elevation to BFE on a filled riverine site. No fill is permitted in coastal high hazard areas.

The role of communities in administering the NFIP is also based upon mapped flood zones. By their participation in the NFIP, communities agree to regulate all development in 1% annual chance floodplains and to impose a permitting process that acknowledges the contribution of run-off from areas of a watershed outside the regulated floodplain to the risks at the bottom of the hill where the highest risk floodplains are located.

Although not all locally known flood prone areas are identified on FEMA's mapping, these areas may still be regulated locally and lenders may still require flood insurance as protection of their collateral, even though federal regulations do not seem to apply. There are a large number of flood hazard areas that have not been delineated, yet still present a serious threat to people who may choose to buy or build within them. The most pressing problems exist in or near communities that are growing,



*This elevated house was the only one left standing on Wiggins Street after Hurricane Katrina hit. The owners had mitigated their home in 1999 with Increased Cost of Compliance funds through the National Flood Insurance Program by elevating their house above the required level in order to further protect against flooding.*

*Photo by Robert Harris.*

but these are not the only places of concern. Cumulative effects and other conditions recognized as affecting flood hazards are locally and voluntarily regulated until federal mapping mandates such regulation.

Within both riverine and coastal hazard flood zones are areas studied and mapped only approximately, meaning that no BFE has been determined for them. Within both types of zones are also areas of shallow flooding for which only a depth of flooding is determined to the nearest whole foot, rather than a BFE per se. In such areas in particular, local communities may require additional freeboard, or a safety factor expressed in feet, above the approximate height of the base flood in order to provide additional protection in these areas of uncertainty. Communities can also require freeboard in areas where base flood elevations are established as a means of additional protection, as the height of the regulatory flood is a probability or risk that can be exceeded.

### Regulation and administration with the NFIP

FEMA is responsible for establishing national policy for floodplain regulation, assuring community compliance (including providing technical assistance), and administering the flood hazard mapping programme. Federal regulations serving as the basis for the NFIP and administered by FEMA<sup>3</sup> describe the programme, define terms used, provide minimum floodplain management criteria for communities to adopt and enforce, provide technical criteria and requirements for revising and amending the flood hazard areas on the maps, and codify fees charged for reviewing map changes.

Sound use of land is a primary tool in achieving protection from flooding, and therefore local governments play the largest role in effective and successful floodplain management. Before

*“For. . . structures located within a 1%-annual chance floodplain, government-regulated lenders are legally required to impose the mandatory flood insurance purchase requirements. . .”*

### Abbreviations

**ASFPM** – Association of State Floodplain Managers  
**BFE** – Base Flood Elevation  
**CFM** – Certified Floodplain Manager  
**CFR** – Code of Federal Regulations (administrative rules)  
**EC** – Elevation Certificate  
**FEMA** – Federal Emergency Management Agency  
**FIRM** – Flood Insurance Rate Map  
**NFIP** – National Flood Insurance Program  
**USC** – United States Code (statutes)

flooding occurs, each community must understand and assess the flood risks within its jurisdiction, researching historical reports and technical studies or maps. They must institute and enforce floodplain regulations that as a minimum meet the criteria set by federal regulation. A community must coordinate its floodplain management with other community activities and programmes to assure that no inconsistencies exist and that its programmes support each other.

Communities are required to maintain records of flood proofing of buildings and of lowest floor elevations of new and substantially improved structures. This information provides guidance in planning for emergency response, knowing which buildings are more likely to suffer flood damages at various flood stages. Related to this activity is maintaining current and accurate depiction of flood hazards on the effective Flood Insurance Rate Maps: communities must report to FEMA within six months of any change in BFE and/or floodplain extent resulting from physical changes affecting flooding conditions.

Part of a community's preparation for flood disasters includes investigating what the community has already done to lessen consequences of future floods. Activities that are not part of NFIP regulations but are part of a sound local mitigation plan that can earn community-wide credits toward reducing insurance rates include flood forecasting and warning systems, buying out flood-damaged properties and converting them to open space, construction and maintenance of flood protection facilities, and controlling run-off from developing areas outside the floodplain. Building public awareness of flood hazards and flood damage potential is another strong tool in both prevention of and recovery from flooding events.

*“Communities are required to maintain records of flood proofing of buildings and of lowest floor elevations of new and substantially improved structures.”*

The elevation certificate

**Elevation Certificates**

The Elevation Certificate (EC) is a versatile standardized form used to compare elevations of the ground to building elements and to the height of the regulated flood. This form (Form 81-31) is used for insurance rating, for community compliance with NFIP minimum record and insurance permitting requirements, and for applications to FEMA for updates to official flood mapping. The different uses

guide the way in which the EC is completed.

Land surveyors are the primary professionals completing the EC, although engineers and architects licensed in states allowing them to collect and report topographic data may also complete them. While FEMA may prefer surveyors to do this work, the federal agency cannot infringe upon the scope of state-issued licences.

The EC documents the location of the premises, the number and size of appropriate flood openings to equalize floodwater pressure inside and outside of the structure, the FIRM referenced for determining flood hazard zone and BFE, and the elevations and locations of various structural elements. If the form is being utilized for community permitting processes, the EC may also contain information regarding required design elevation, or the height above BFE that the lowest floor or lowest structural member of buildings must be constructed.

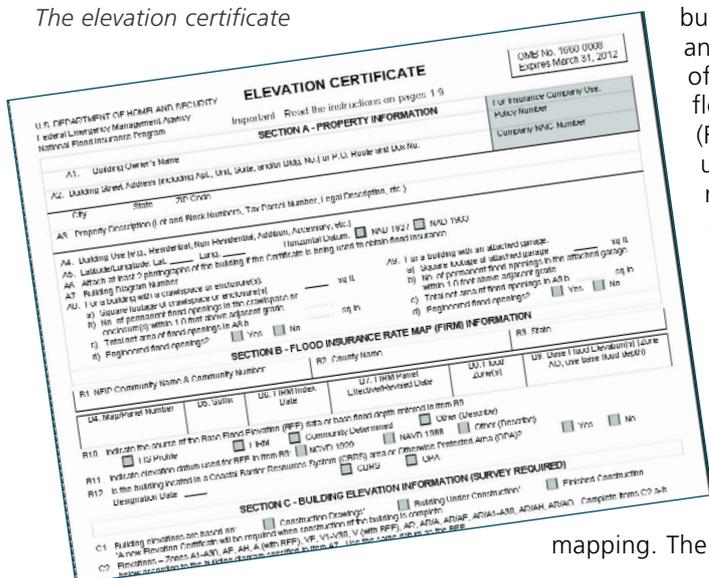
For communities keeping records of lowest floor elevations in order to plan for disaster response (and for NFIP compliance), the EC or digital equivalent of this data provides a consistent approach. When NFIP mapping changes the extent or depth of regulated floodplains, the longitude and latitude reported on the EC allow communities to notify affected property owners. In post-disaster buyouts of repeatedly flooded properties, the EC offers information needed by appraisers, insurance agents, and the entity purchasing the premises for dedicated open space.

A number of other forms supplement the NFIP, including various application forms to update mapping that require varying levels of technical detail and community acknowledgment. MT-1 forms are used to report data for amending maps when more detailed technical data is available than was incorporated into the original study. MT-2 forms are used for revising maps when physical conditions have altered the horizontal and/or vertical extent of regulated floodplains. For map amendments relating to a single residential property, the MT-EZ form is appropriate. For this last application, the EC is an effective and systematic means of reporting the necessary elevation measurements and documenting the existing FIRM information.

**Certified Floodplain Managers**

The Association of State Flood Plain Managers (ASFPM) was organized early in the history of the NFIP, primarily to confront the shortfalls of the new national programme while supporting the concept behind it. States throughout the country found conflicts between their own pre-existing regulations and the new federal rules, and local governments had similarly been overlooked.

In 1999 ASFPM began the Certified Floodplain Manager (CFM) programme and



improve floodplain managers' knowledge and to provide a uniform background for the many facets of floodplain management. A certification exam to achieve CFM status includes questions addressing floods, flood mapping, floodplain regulation (and contextual history), flood insurance, and flood loss reduction, especially mitigation. Certified individuals must then meet continuing education requirements every two years to maintain their status.

Because not all individuals achieving CFM status are in government positions regulating floodplains, the benefits of the programme are far reaching. Concerned citizens as well as design professionals such as surveyors and engineers bring their educated voices to the table in discussions affecting their homes, businesses, and communities. Public hearings before informed audience members are more likely to address the details of proposals that most concern locals. Professionals speaking before planning and zoning boards earn credibility for knowledge beyond their traditional expertise. More effective communication and unified efforts in achieving sound floodplain management are the ultimate rewards.

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1. "A Unified National Program for Managing Flood

Losses; Communication from the President of the United States Transmitting a Report by the Task Force on Federal Flood Control Policy", #67-221, Government Printing Office, Washington, DC, 1966.  
 2. 42 US Code 4001 et seq.  
 3. Title 44 of the Code of Federal Regulations (CFR), Part 60

#### Reference materials

Federal Emergency Management Agency:  
<http://www.fema.gov>

Guidelines and Specifications for Flood Hazard

#### Mapping Partners:

<http://www.fema.gov/library/viewRecord.do?id=2206>  
 Technical Bulletins:

<http://www.fema.gov/plan/prevent/floodplain/techbul.shtm>

Maps and data: <http://msc.fema.gov>

Current maps, historical maps, current Letters of Map Change, Flood Insurance Study Reports

US Federal laws and regulations:

<http://www.fema.gov/business/nfip/laws1.shtm>

Specifically, 44 CFR 59 et seq., FEMA (from Government Printing Office):

[http://www.access.gpo.gov/nara/cfr/waisidx\\_02/44cfrv1\\_02.html](http://www.access.gpo.gov/nara/cfr/waisidx_02/44cfrv1_02.html)

Specifically, 42 USC 4001 et seq. (National Flood Insurance Act of 1968, as amended, and The Flood Disaster Protection Act of 1973, as amended):

<http://www.fema.gov/library/viewRecord.do?id=4550>

Alternative for accessing 42 USC 4001 et seq.:

<http://www.law.cornell.edu/uscode/42/ch50.html>

Association of State Flood Plain Managers (ASFPM):

[www.floods.org](http://www.floods.org)

#### About the author



**Wendy Lathrop** is licensed as a Professional Land Surveyor in New Jersey, Pennsylvania, Delaware, and Maryland, and as a Professional Planner in New Jersey. She is also a Certified Floodplain Manager (CFM) through the Association of State Flood Plain Managers. She represented the American Congress on Surveying and Mapping on the Technical Mapping Advisory Council to FEMA and later served on a panel studying flood hazard mapping accuracy resulting in the report *Mapping the Zone: Improving Flood Map Accuracy* (published 2009).



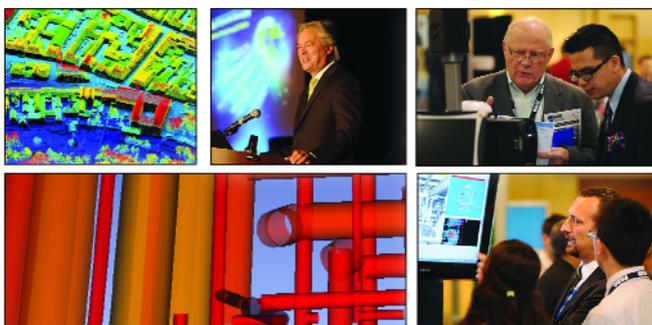
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## Technical Sessions: Land Administration & Cadastre

Hundreds of papers were presented at May's FIG Working Week in Rome.

**Richard Groom** guides us through the technical sessions with a focus on Land Administration and Cadastre. In the next issue of GW we will cover laser scanning, geodesy and monitoring. Full papers can be downloaded from <http://www.fig.net/pub/fig2012/techprog.htm>

**Juliana Opoku Nyarku** and **Okumani Adu-Gyamfi** discuss (in TS01E) the urban/rural ('peri-urban') interface on the edges of Africa's cities. These areas of rapid development can leave the rural poor as slum-dwellers. The paper describes a 'pro-poor' approach to land management and administration in Kumasi through the Ghana Land Administration Project (LAP). However, administration of the LAP places the management of customary land in the hands of Customary Land Secretariats even though customary land owners are the problem rather than the solution. In Kumasi, 83% of land occupiers who responded to questions claimed that their land had been taken over by the traditional authorities and of these only 32% claimed to have been notified about this.

Security of tenure is clearly at the root of the problem yet land registration is too expensive for the poor. The authors recommend that title to individual plots of customary land should, at least to some degree, rest with the occupiers, rather than the local chief; that there is a need for more effective education of the rural poor; and that there should be more stringent enforcement of planning regulations. In session TS02D **Ephraim Danso** and **Michael Barry** gave a different perspective on the topic.

In Tanzania, **Felician Komu** (TS02D) from Ardh University argues that customary tenure should be done away with completely, in favour of a more transparent government-controlled system. He acknowledges that such a move would face stiff resistance from those with vested interests. He defines the rural/urban clash as between low value unregistered 'customary land' against high value registered land. The argument against registering rural land is based upon cost, but why does cadastral survey have to be "accurate to a fraction of a millimetre"?

In TS01G, **Douglas Black** (National Directorate of Lands and Forestry, Mozambique) urges aid agencies to turn away from sponsoring 'studies' and to focus on the logistics of implementing land governance projects through a standardised approach. On cost, Black describes a process for registering land rights and quotes an average of \$25 per title. The standardisation approach applies to training, equipment and resources. This has the advantage of making the process scaleable. A bottleneck is donor organisations' procurement processes. Standardisation helps streamline these too.

In Session TS09L **Anttonen** discusses lessons learnt from the Cambodian Land Management and Administration Project. They were able to register properties for \$10, surely a success, but the author highlights some lessons for the World Bank, in particular and

has some wise words to help take projects from 'donorship to ownership'.

**Le et al** (TS09L), investigate the differences between the 'standard' Land Administration Domain Model (LADM) and the Vietnamese Land Administration System. One of the difficulties is that land in Vietnam is owned by all people with the state as representative owner, although individuals can own objects on the land, like buildings and can be granted leases and other rights to use the land. The conclusion is that LADM can be applied with modifications to suit local circumstances.

In session TS03A, **Rohan Bennett et al** call for federated countries (Australia, in particular) to adopt national land administration infrastructures so multipurpose cadastres can realise their full benefits. Several other papers in the same session made similar points.

**Enemark** (TS04A) states that, in some way, all countries have to deal with the management of land through the four functions of land tenure, land value, land use and land development. "Spatial enablement is not primarily about accuracy – it is about adequate identification, completeness and credibility" he says and offers ten principles of land administration and three key demands for sustainable land governance: government should be spatially enabled, the spatial framework should be fit for purpose and land governance should support the global agenda.

TS03B looked at the use of crowd sourcing in land administration. **Eliaisa Keenja et al** canvassed the views of Netherlands Kadaster staff members and then used Q-methodology to sort the results into a number of 'belief clusters' – a form of classification and grouping of views.

**Robin McLaren** sees the mobile phone as key for transferring cadastral information from the field to the land administration authority. He identifies risks and offers various solutions, particularly through the use of 'community knowledge workers' as intermediaries. Perhaps success depends upon the extent to which the community knowledge workers can be trusted. In this session, **Daniel Steudler** presented the executive summary of an FIG report on Spatially Enabled Societies.

In TS07B, **de Zeeuw** (Netherlands) looks at the way the Dutch cadastre has evolved in response to economic and political changes, including open data, self-service and crowd sourcing. Under the headings "people", "profit" and "planet", the author gives examples of the changes that have so far been made. **Grant** (New Zealand) is concerned about the sustainability of New Zealand's geospatial datasets in an era when positioning technology is putting geospatial

“... some wise words to help take projects from 'donorship' to ownership.”

applications into the hands of the general public. A cadastral strategy is being developed looking ahead ten to twenty years. **Nyongesa** (Kenya) describes Kenya's programme to convert the Ministry of Lands paper-based records to GIS. Work started in 2008. Records have been prepared for scanning, the country's geodetic network is being upgraded and computer systems are being procured, but the project suffers from funding issues.

In TS07B, **Van Der Molen** (Netherlands) looks at Hernando de Soto's landmark book, *The Mystery of Capital*, and the views of its many critics to see if de Soto's ideas still stand up today. For those who do not follow the reasoning behind the common view that security of tenure is the silver bullet that releases the poor from poverty, Van Der Molen's paper gives a useful and balanced explanation.

In TS01G, **Rizqi Abdulharis** from the Institute of Technology of Bandung, Indonesia presented a paper on land and marine administration on the island of Ambon. This case study describes customary land tenure, land use rules and then their marine equivalents. All fascinating. Whilst reading this, it occurred to me that use of 'geo-fences' to control where fishing takes place could be a more effective way to control the industry than applying landing quotas.

In Session TS09H, **Lee et al** describe the use of network RTK for reform of South Korea's 100 year old paper-based cadastral system. The reforms include the introduction of a 3D digital cadastre and use of aerial photogrammetry and GNSS RTK positioning. Network RTK is used to establish third order control from which the surveyors fix boundaries using traversing.

**Yoo and Ju** present a case study of land registration using satellite photogrammetry in Turkmenistan. They describe a pilot project making use of GeoEye imagery and give details of their methods of ground control and photogrammetry. Of course, photogrammetry does not detect legal boundaries, but in Turkmenistan most of the land is owned by the state, so the priority was to produce base mapping for land information management rather than to secure property rights. It is however strange that having gone to the trouble of setting up stereo models, the project ignored the third dimension and the added value it could bring.

**Education**

**Greenfeld** (Israel) has been involved in developing the 'survey body of knowledge' for some years. His paper (TS04i) brings this valuable work up to date with his 'nearly final' findings. **Groenendijk** (Netherlands) *et al* test the attributes of Land Administration to decide if it is an academic discipline. Their conclusion is 'no' but that it is either a discipline in formation or an emerging area of interdisciplinary study based upon land registration and cadastre. **Roy** (Canada) discusses



*Customary land rules in Ambon: Sign showing the application of sasi kelapa, a seasonal regulation which controls the harvest of unripe coconuts. By kind permission of Rizqi Abdulharis*

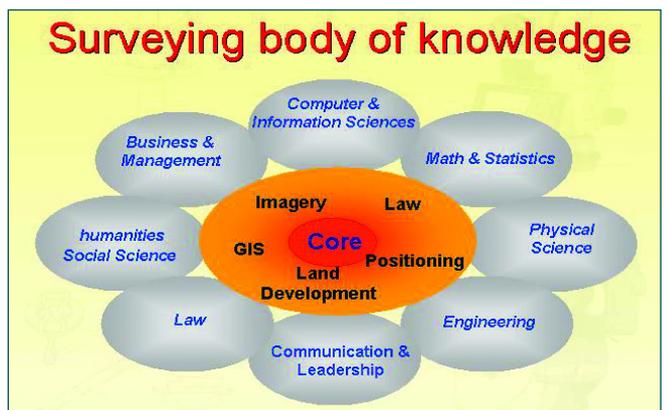
how the ever increasing scope of geomatics can be taught without increasing the length of the courses. He rejects the idea of withdrawing "less important" courses, instead going for a "new program approach" involving the integration of case studies, problem solving and competencies development. His paper should stimulate some debate.

Session TS06A focused on the marketing and management of professional surveying education. **Musungu and Motala** (South Africa) demonstrated that bringing research into the community can motivate people to become surveyors. Indeed, when they asked students what made them interested in studying surveying the answers in order of popularity were: observing surveyors working in their neighbourhoods, from discussions with a relative and through a school visit by a professional land surveyor. **Vaskovich** (Sweden) studies the effects of introducing tuition fees and falling rolls and suggests a solution using a combination of cost cutting and the introduction of innovative curricula.

**3D SDIs**

Session TS06F included papers on the development of 3D cadastral systems in Italy, Argentina, Indonesia and Australia. In the latter, **Rajabifard et al** give three principles for the 3D cadastral data model: the 2D cadastral data model is a sub-set of the 3D cadastral data model; the 3D cadastral model should accommodate 3D rights restrictions and responsibilities and their association with

*“For those who do not follow the reasoning behind the common view that security of tenure is the silver bullet that releases the poor from poverty...”*



*The Survey Body of Knowledge (Greenfeld).*

physical objects and also represent their spatial extent; the 3D cadastre should cater for a broad range of land administration functions including land tenure, land value, land use and land development with sufficient detail.

In TS08H, **Duncan** and **Abdul Rahman** (Malaysia) look at the integration of surface, above surface and subsurface city models. They put forward a topological 3D object-oriented data model and provide a UML diagram for the top hierarchy class. **Breunig** (Germany) et al, consider the modelling requirements for planning, design and construction of a city subway line. They consider the question of scale and generalisation from LoD5 down to LoD1. **Gal** and **Doytsher** (Israel) see 3D spatial analysis of built-up areas as one of the day's challenging topics. They present an algorithm to identify the objects that are visible from a single point. **Agostino** (Italy) et al have been developing a mobile mapping system for 3D GIS data collection. The system includes GPS and INS for navigation, video cameras for imaging and a laser scanner to produce a point cloud on which to drape the video images. However, the product comprises solid images rather than a coloured point cloud.

“... bringing research into the community can motivate people to become surveyors.”

### Survey Control

In session TS05J, **Chang** (Malaysia) describes the survey control requirements for Kuala Lumpur's Klang Valley rapid transit project. Staying in Malaysia, the national mapping agency (JUPEM) have been tasked with compiling, in a single repository, underground utilities records for the nation. This is a new field for Malaysian surveyors and **Jamil** (Malaysia) et al describe how they are going about this work.

TS03K was a special session on the Japan earthquake of 2011. **Yamagiwa** et al described their approach to dealing with the effect of the earthquake and its aftershocks on Japan's dense network of CORS. One aspect of this was to use the CORS data to assess when crustal deformation had subsided to a level where they could publish reliable new coordinates for the stations. **Yoshikawa** et al discuss the use of multi-source and multi-temporal remote sensing during the incident. They note the value of SAR data for mapping inundation and automatic change detection. **Nagayama** et al describe the response to the disaster of the Japanese national mapping agency and point out some improvements they can make in the light of experience.

### Imagery

In TS05E, **Caprioli** and **Scognamiglio** (Italy) describe the use of satellite imagery from different sources for change detection,

including the image preprocessing steps needed to make the datasets compatible.

In Session TS06I **Akbari** and **Safari** (Iran) investigate various methods of target detection and apply them to hyperspectral remote-sensing data. They find that a new algorithm, Support Vector Machine is a valid and useful alternative to more established methods. **Baiocchi** (Italy) et al study the use of high-resolution multispectral satellite images for coastal monitoring. They use WorldView-2 data and find it particularly useful for identifying wet and dry sand. Looking forward, they anticipate that DTMs integrated with the radiometric results would produce more information.

**Mutluoglu** (Turkey) et al, look at the optimum size for photogrammetric ground control targets for WorldView-2 imagery. **Papakosta** (Greece) et al, propose using linear features to provide ground control in plan for historical photography where points are more difficult to find and more likely to be misidentified. They tested their method on aerial photography from 1945 and note that the results were much better than using solitary ground control points. **Uysal** (Turkey) et al, describe the photogrammetric survey of Afyonkarahisar and Mevlevi Lodge, Konya using a Samsung S730 non-metric camera. Camera calibration was carried out using Photomodeler software; 139 ground control points were surveyed on the historic building.

In Session TS07E, **Konecny** (Germany) looks at the economics of various methods for boundary surveying. He sees the topology of the boundary as more important than geometrical accuracy and suggests aerial ortho-mapping to produce preliminary parcel boundaries by image interpretation during the adjudication process but leaves open the possibility to survey by more accurate methods (eg GNSS) in situations where greater accuracy is demanded. This would speed up the registration process. **Marechal** (Belgium) describes the State Boundaries of Europe project to compile a multipurpose dataset, which will be the “definitive” description of all European state boundaries. Belgium is contributing to this through the “General Administration of Patrimonial Documentation” – a government department that maintains Belgium's international boundaries.

### Land fragmentation and consolidation

In TS09E, **Demetriou** (Cyprus) et al, present a new methodology for measuring land fragmentation, which integrates GIS with multi-attribute decision making. The resulting model, called LandFragmentS outperforms the existing indices.

In TS02E **Seija Kotilainen** and **Kalle Kontinen** from Finland advocate the inclusion of environmental protection measures (eg wild field borders and wetland areas) within land rearrangement schemes as a means of reducing pollution in the Baltic Sea area.

Premark for WorldView-2. Inset shows view of premark from satellite. (Mutluoglu)





## A right to hack but not to publish

By Carl Calvert

A simple question of telephone hacking. However it is nothing to do with News International but is the case of *Draksas v Lithuania* (application 36662/04) in the European Court of Human Rights (ECHR): judgement being given on 31 July 2012. **Carl Calvert** explains why state security outweighs an individual's rights in the EC.

• Carl Calvert MA MSc PgDLaw FRICS CITP MBCS, is the sole principal of Calvert Consulting, specialising in Boundary litigation. He also lectures part-time in GIS law. [www.calvertconsulting.co.uk](http://www.calvertconsulting.co.uk) Email: [carlcalvert@aol.com](mailto:carlcalvert@aol.com) or 023 8086 4643.

This case is important as it sets out how European law deals with phone hacking. Article 8 of the ECHR provides a right to respect for one's "private and family life, his home and his correspondence", subject to certain restrictions that are "in accordance with law" and "necessary in a democratic society". Article 13 provides for the right for an effective remedy before national authorities for violations of rights under the Convention. The inability to obtain a remedy before a national court for an infringement of a Convention right is thus a free-standing and separately actionable infringement of the Convention.

In simple terms, the individual has rights subject to his or her nation state's rights to maintain a democratic society. I am not going to argue here as to what a democratic society is nor what the Court would hold but take it at face value that those states signing up to the ECHR are democratic states. Article 13 is a 'catch all' in that if the state does not provide a remedy at least then the ECHR does.

Draksas complained that his telephone conversations had been intercepted and they had been disclosed to the public. He alleged a violation of Article 8 of the Convention. He also submitted that he did not have an effective domestic remedy in respect of the above complaint, in breach of Article 13.

The application was communicated to the Government on 24 November 2006. And it was decided to rule on the admissibility and merits of the application at the same time (Article 29 §1).

The Court first turned to the applicant's complaint that he had no remedy against the Vilnius Regional Court's order of 17 September 2003 to authorise the tapping of his telephone. On this point the Court shares the position of the Court of Appeal to the effect that the very nature and logic of secret surveillance dictate that not only the surveillance itself but also its authorisation may be effected without the individual's knowledge (Draksas had argued that there had been no lawful grounds for the tapping, and that his rights under Article 8 of the Convention had been breached and further complained about the absence of a domestic remedy against the court order authorising phone tapping, alleging a violation of Article 13.

By a letter of 6 April 2004, the President of the Court of Appeal returned to the applicant his complaint without examination. The President stressed that to grant a person the right of access to court orders authorising

operational measures and to allow him to challenge such court orders would deprive the secret investigative actions of their meaning. He also noted that Article 8 of the Convention did not prohibit secret investigative measures as such, provided that the interference involved was necessary in the interests of national security or for the prevention of crime. Well-reasoned court orders were to guarantee that the investigating authorities acted within the law.

The ECHR observed that the requirements of the Convention, notably with regard to foreseeability, cannot be exactly the same in the special context of interception of communications for the purposes of criminal investigations as they are where the object of the relevant law is to place restrictions on the conduct of individuals. In particular, the requirement of foreseeability cannot mean that an individual should be enabled to foresee when the authorities are likely to intercept his communications so that he can adapt his conduct accordingly (see *Malone v. the United Kingdom*, 2 August 1984, § 67, Series A no. 82). The Court reiterated its opinion that such notification might serve to reveal the working methods and fields of operation of the intelligence services and even possibly to identify their agents (see *Klass and Others*)

The ECHR declared that the application was admissible and held that: (a) there had been a violation of Article 8 of the Convention on account of the leak of the applicant's conversation to the media; (b) there had been no violation of Article 8 of the Convention on account of the interception and recording of the applicant's conversations and the disclosure of his conversations during the Constitutional Court proceedings; (c) there had been a violation of Article 13 of the Convention on account of absence of subsequent judicial review of surveillance applied in respect of the application; (d) there has been no violation of Article 13 of the Convention on account of not informing the applicant about the initial decision to tap his phone and refusal to disclose to him the information gathered on him during the interception.

So, finally we see that state security outweighs an individual's right but the right of an individual against leaking of that individual's conversations to the media is contrary to that individual's rights. As to Article 13 about ECHR provision of a remedy where the individual's state has not provided such remedy; that was reinforced. How will this ECHR judgement be considered in the UK's Royal Courts of Justice? We shall just have to wait and see.



# History Workshop's enthralling presentations

by John Brock

Joining over 1500 guests in Rome from over 100 countries to attend the biggest ever FIG Working Week in May this year and hosted by the Consiglio Nazionale Geometri e Geometri Laureati, **John Brock** reports on the History Workshop that preceded the main event and several visits to historic sites with surveying and mapping links.

**H**aving seen prior information on the *Instituto Geografico Militare* in the legendary Italian town of Florence I planned my fast train trip before the History Workshop. Upon arrival I found my way to this establishment where the very cooperative security guard arranged for the librarian to take me on a private guided tour of this really fantastic repository of historic surveying instrumentation and maps.

There is a corridor lined with stained timberwork bearing gilt paintings of ancient measuring equipment and survey scenes painted by one of the talented and enthusiastic staff of the Military Geographic Institute. This place is a must for lovers of surveying history but advance bookings must be made even though there is no charge for a visit. While in Florence another must-go for those who delight in the heritage of measurement is the newly named Galileo Museum (formerly the Museum of the History of Science), which has on display some superb examples of early measuring devices some actually used by the famed inventor of the telescope himself along with original editions of his texts on various instructional techniques associated with the usage of his innovations, some of which could be utilised for accurate distance determination.

As a precursor to the working week, the History Workshop conducted by the FIG International Institution for the History of Surveying and Measurement (IIHSM) attracted over 50 attendees from 12 countries. IIHSM Chairman Prof **Jan De Graeve** from Belgium welcomed guests with a stirring introduction and later a brilliant presentation on **Gerhard Mercator**, surveyor and map-maker (1512-1594) to celebrate the 500th anniversary of his birth.

## A solemn moment

After a minute's silence in commemoration of the recently deceased Prof **Michael Cooper** the first speaker, **Michael Ferrar** (an ex-pat English architect who has lived with in France for over ten years) gave a thoroughly enthralling presentation, which he dedicated to the memory of our great colleague. Prof Cooper would have been extremely proud that such a great set of research was released in his memory. Michael showed details of wooden circles dating to c. 3000 BC, which demonstrated extraordinary measuring capacity in the formation of the circular layouts and construction of the mysterious structures in both elevation and position.

Next, Scot **Alec McEwen** from Canada gave a fascinating overview of the dispute between

Canada and the USA for the ownership of Machias Seal Island off the coast of Nova Scotia, which has been smouldering for many years. Canada stakes a solid claim for this island since the construction and continuous occupation of the lighthouse on this wildlife sanctuary. Final possession will be fought out in the courts.

Our third speaker was **Walt Robillard**, a US lawyer specialising in land boundary disputes. He made a strong case for the "fourth" man of Mount Rushmore, President **Teddy Roosevelt**, to be included as an honorary surveyor for his exploration of the Amazon River area of South America. He discovered an unknown river but for many years his find was discredited. More recently his find has been ratified and acknowledged with naming of the lost river in his honour. Surveyors already claim the other three heads of George Washington, Thomas Jefferson and Abraham Lincoln as their own. Walt also made a presentation for his mate "Bob" who was unable to attend. This was associated with the land dealings of the 1600s.

Our Norwegian speaker **Bjorn Ragnvald Pettersen** detailed how Norway was introduced to geodesy and astronomy as academic surveying disciplines was followed by Jan with his Mercator paper. Jan also filled in for Jim Smith who was unable to attend with a brief update on the possible extension to the Struve Geodetic Arc World Heritage Monument right to the end of the African continent.

After lunch at one of the many sumptuous boutique food cafes we were most privileged by the attendance of the FIG president CheeHai Teo who gave us an inspirational address of enthusiasm for the colourful history of our profession for which we were all most proud and appreciative.

## Roman surveying and mapping

**Michael Ferrar** then returned with a brilliant tale of the "The Roman World Survey: Before, After and its Legacy" during which we were left with little doubt that a plan of this world survey had been made at the turn of the millennium after Christ; most probably brought to its completion through the work of Marcus Agrippa's sister **Vipsania Polla**, who had married **Caesar Augustus** the incumbent Emperor of Rome.

It was now my turn to bring everyone's attention to the priceless masterpiece of cartography which hangs in the Norman Cathedral at Hereford known as the Hereford *Mappa Mundi* painted in about 1290-1300

*"... showed details of wooden circles dating to c. 3000 BC, which demonstrated extraordinary measuring capacity in the formation of the circular layouts and construction of the mysterious structures..."*



Over 50 delegates from 12 countries attended the workshop, which took place ahead of the FIG Working Week.

by **Richard De Bello** (of Haldingham). Prominent notations on this map pronounce that the 'Survey of the World' was initiated by **Julius Caesar** who gave instructions to four surveyors to carry out this monumental assignment – **Nicodoxus** to measure the East, **Theodocus** the North, **Policlitus** the South and **Didymus** the West.

The map actually leaves out the fourth surveyor and wrongly states that the North and West were surveyed by Theodocus alone. In the bottom left hand corner of the chart the author has even made sketches of three of the four surveyors receiving their written orders from Augustus Caesar. The last surveyor is said to have returned 32 years, 1 month and 20 days after his original departure to present his fieldwork to a very patient Emperor it would appear.

#### Cadastral chief

We were once again singularly blessed with a greeting from the Head man of Italian Cadastral Surveying **Marco D'Alesio** whose congenial Italian greeting was most elegantly translated into English by Sarah Tyacke who is the President of the International Map Collectors Society.

Our fourth speaker in Session 3 was the very distinguished Italian Professor **Mario Bevilaqua** who talked about the contents of his recently published book *Piante di Roma dal Rinascimento ai Catasti* (Maps of Rome from the early 16th century to 19th and 20th century Cadastral Surveys). In attendance for this talk were the President of CNGeGL **Fausto Savoldi**, FIG Congress Director **Enrico Rispoli**, FIG Rome secretary **Maria Scorza** and many other dignitaries from Italian surveying. A most unexpected act of generosity was then made by the Italian delegation when every participant in the History Workshop was given a copy of the Professor's recent book and both he and his co-author **Marcello Fagiolo** autographed each recipient's publication. Such generosity and hospitality with afternoon tea created a most cordial atmosphere for our visit to Rome for which we were all overwhelmed and thoroughly grateful to our warm hosts.

#### Jesus, da Vinci and DVDs

After this incredible welcome to Rome I was then obliged to give a shortened introduction to my treatise on "Jesus Christ, Superstar Surveyor" to curious interest which was then transformed into thrilling excitement by our US surveying history guru **Brian Blevins** who demonstrated how **Leonardo da Vinci** was also a prolific career surveyor producing many exact topographical and boundary plans of some very difficult areas of Italy to where access was most formidable. What better way to finish off a memorable History Workshop than with my most recent DVD show of 15 of the world's most notable TV shows from 1959 to 2009 which had been shown for the first time in the world at the GEO 12 spectacular in the UK in March this year.

Being held concurrently with the History Workshop for the first time in FIG history was the Young Surveyors Conference on 4 and 5 May at which over 120 young surveyors from 40 countries participated in discussions based on the theme of "Knowing to Create the Future." We Australian surveyors are hugely proud of our very own **Kate Fairlie** who is the current chair of the FIG Young Surveyors Network who presided over the proceedings of this most important initiative offering the youth some encouragement to take up the challenges confronting the surveying profession in the future particularly through a greater involvement in the activities of FIG.

On Saturday about 25 of those who had been at the History Workshop met with Jan De Graeve outside The Vatican entrance to be guided through the extensive network of museums by a most entertaining and very funny guide who hailed from Napoli. The many galleries of priceless paintings and sculpture were incredible but the pick of the halls had to be the *Galleria Geografica* which is a 120 metre long hall adorned on each side with large scale-painted maps of all of the provinces of Italy plus an old and new map of the whole country painted by a man called Danti between 1501 and 1504. Any surveyor or map enthusiast who does not get to see this most superb gallery of brilliantly mastered maps has missed out on one of the unknown treasures of The Holy City.

*"The last surveyor is said to have returned 32 years, 1 month and 20 days after his original departure. . ."*



# Have digital camera et al... Will Travel!

by Nick Day

The old American TV Western series, *Have Gun, Will Travel* is today "Have digital camera, laptop, GPS, dongle & wi-fi connection, Will Travel." Where would I be without them? Apart from the gun (and don't underestimate American ingenuity!) a smartphone can take the place of all the above, but is not as comprehensive – and I don't like putting all my eggs in one basket, says our itinerant correspondent.

## About the author

Nick Day, FRICS, FRGS, PLS, is retired from the California Department of Transportation (Caltrans). He can be reached at [feasibility.nick@gmail.com](mailto:feasibility.nick@gmail.com)

Now, if a picture is worth a thousand words, I heard that a GIS is worth 10,000! But, is a picture worth more or less than a thousand words if it's been digitally altered? So many photographers today manipulate their photos in Photoshop or Lightroom, or an HDR (High Dynamic Range) programme like Photomatix. And, there's an old joke in journalism that you should never let the facts get in the way of a good story. Put manipulation of photos together with journalistic spin, and what do you have? Propaganda? Half-truths? Dishonesty? All of the above? At least with a camera producing RAW files, as with a total station, the original data cannot be changed and truth can be validated. This is critical if using data in court.

From the age of about 11, I've always had a camera. I started with a box Brownie, which produced black and white negative film, often printed at just 3" x 2" to save on costs. I still have many in old albums that really haven't deteriorated much in quality. Progression was then through better and better cameras – 35mm film, dual lens reflex, 2" x 2" format, single lens reflex (SLR) film, point-and-shoot (PAS) simple 3Mpx digital, to full-frame DSLR at 18Mpx. Even some PASs and smartphones today are capable of 12Mpx and capturing HD video and stereo audio. We saw this during the Arab Spring with locals, right in the thick of violence, capturing scenes while foreign correspondents, with serious photo-journalism equipment, were not allowed in. What would those Baltic soldiers during WWI, mentioned in my last column, have given for a smartphone or PAS camera?

Even at 11, I knew instinctively the value of a camera for capturing that special scene. However, the Brownie's simplicity did not allow much subject movement or hand shake before pictures were blurred. It was fixed aperture lens and speed. As the light faded, pictures became dark. Now, a good DSLR will have a shutter speed of say 1/8000 sec, and ISO rating of at least 6400. Freezing a humming bird in flight is possible, as is capturing a photo of a black cat in a coal mine... well, almost! Some cameras can take a series of photos and stitch them together as a panorama, with built-in software, without downloading to a computer. Others can perform HDR corrections in the camera (blends light and dark parts of a series of photos of the same scene, using aperture bracketing, to get an even balance). Then we get into the really sophisticated world of such equipment

as the 360° Spheron VR, albeit at a much higher cost, capable of onboard HDR, its own built-in LED subject illumination (far beyond flash capabilities), 50Mpx, and 26 aperture stops.

But, I never dreamed how, thanks mainly to software, uses for cameras and photography would progress. Over the years I've written about photography in Overcurrents, most notably laser scanning vs terrestrial photogrammetry (Mar/Apr 2010), and a brief history of cameras and photography gleaned from a museum in Vevey, Switzerland (July/Aug 2011). In one article I offered a tip, while travelling, of taking photos of local town maps that could be used later as walking guides by zooming in on the camera's LCD. But, carrying around a bulky DSLR, with an equally big and heavy zoom lens, all the time so as never to miss a photo op can be tiring, not to mention getting a sore neck. So, as I don't have a smartphone, I invested in a topnotch small PAS which fits in a shirt pocket and is with me 24/7. The uses are legion: taking a photo of the back of a DVR player to see how the wiring is hooked up before dismantling to move elsewhere; shooting the front of the house, downloading the jpeg to a PC, then using Adobe Photoshop to see how new windows or a colour scheme will look; before and after photos on construction projects as a record, or in a legal case; and taking a photo of a mole or rash to email your doctor's drop box for a preliminary evaluation. Or simply for copying documents.

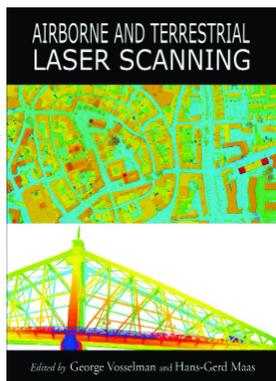
Lastly, much is talked about enhancing productivity and creativity. But are these the real value of iPads, iPhones, and augmented reality 3D surveys? Or are they just gadgets to increase consumerism, to sell more stuff to more people? If so, I fear it's not sustainable. I just read that tablets (iPad, Kindle, etc) are the #1 item on everyone's gift wish list, and Android OS's still outnumber iPhones by a wide margin. The "have-nots" of third-world countries, eager to catch up the developed world see smartphones as a springboard to a better standard of living, a means of leveraging their lot in life. Witness farmers in poor African nations now having direct access to commodities' markets and current prices without being fleeced by unscrupulous middle men (see also Robin McClaren's article in the Jan/Feb issue of *GW* on crowdsourcing for land administration). On the other hand it seems "the haves" too often are using them as playthings, trappings of comfort and frivolity.

## Topcon's advanced GNSS RTK system



An advanced GNSS RTK receiver with an extremely compact and lightweight design has been announced by Topcon Europe Positioning. The HiPer SR weighs in at 0.8kgs and is aimed at surveyors for small boundary or setting out work, non-traditional users such as landscape architects who need a low-cost mapping solution, law enforcement and others requiring high-accuracy 3D positioning. Cable-free and simple to operate, Topcon claim the HiPer SR is the most compact professional-grade base and rover RTK system available. The field-rugged and fully-integrated design delivers a 300 metre working radius through Topcon's new LongLink technology; a wireless data link developed specifically for the HiPer SR that provides reliable and interference-free RTK base-to-rover communications. A sealed battery pack provides more than 15 hours of operation and the shock-resistant magnesium alloy housing allows the HiPer SR to take a 2 metre pole drop onto concrete.

## Award for book



We are pleased to report that *Airborne and Terrestrial Laser Scanning*, from Whittles, has been awarded the Karl Kraus Medal by the ISPRS at the XXII Congress in Melbourne. See the May/June 2010 issue of *GW* for a full review. Copies of this title are also available via our website.

Whittles has also announced the publication of *High Resolution Satellite Imagery* by Ian Dowman, Karsten Jacobsen, Gottfried Konecny and Rainer Sandau. *GW* will publish a full review of the title in the next issue but if you can't wait, or need more details, you can order a copy via our website [www.pvpubs.com](http://www.pvpubs.com)

## iSTAR 360 unveiled

Leica's HDS UK user symposium (see page 21) was also an opportunity to see what GEO-12 attendees missed. NCTech

presented a fully working iSTAR 360° rapid imaging camera. The 1.41kg device is a black anodised aluminium 10cm cube enclosing four lenses, GPS, wifi, digital compass and a 50 Mpx sensor that captures a 360° panoramic image in one shot. Control is via a touch-screen on the cube's top surface and USB and ethernet outlets are fitted for data extraction. The device can also be remotely controlled and there is even a mounting kit for Leica's C5 and C10 scanners.

## BRIEFS

In line with the launch of Topcon's HiPer SR GNSS RTK receiver, the company has also introduced updates to its MAGNET suite of software products. **MAGNET Field** software runs on field controllers and total stations while **MAGNET Office Tools** is a standalone processing software or add-on to AutoCad. Updates include support for more geoids and SDR33 raw data export is now an option to export GNSS points (18RK) as standard points (08RK).

Topcon has also announced that its recently launched **Tesla** controller and the **GRS-1** 72-channel, dual-frequency L1/L2 GPS receiver are now compatible with ArcGIS Mobile by utilizing the new Topcon eGPS GNSS configuration

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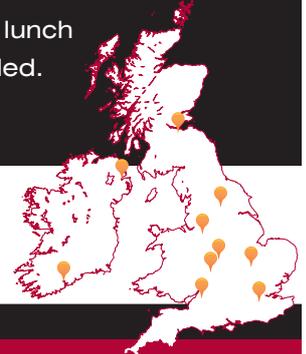
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utility. Jason Hooten, North American GIS sales manager, adds, "With Topcon eGPS running on the Tesla and GRS-1, with ArcGIS Mobile you can tap into high-end GPS/GNSS receivers to easily update database accuracy and attribute information with one compact device."

Leica Geosystems has announced the **Viva GS08plus**, a small and lightweight cable-free high-accuracy GNSS system. With flexible setup options and equipped with Leica SmartWorx Viva LT onboard software, the Viva GS08plus offers affordable entry into dual-frequency RTK surveying. Together with the SmartAntenna and Viva CS10 controller on a carbon telescopic pole weight is just 2.6 kg.

Leica Geosystems has also added to its iCON range of measurement technology with the launch of Leica **iCON Office** to communicate with instruments and external field computers for transmitting and

receiving data. The software works seamlessly with the Leica iCON CC50 and CC60/61 field controller, and the MPC1310 machine control computer.

Altus Positioning Systems has announced the **APS-U GNSS** receiver, which is scalable from a single standalone GNSS receiver to full options with heading, wireless links, precise point positioning and RTK capability. The unit has an additional processor for on-board configuration and custom applications separate from the GNSS engine. "The APS-U provides multi-frequency capability together with GNSS heading, L-Band positioning and wireless communications, all within a hardened housing that meets military environmental specifications," said Neil Vancans, CEO and president of Altus.

Altus has also introduced a GPS-based system for GIS applications. The **ikeGPS** is a multi-sensor data-acquisition system with a variety

of built-in software tools for specific data-collection projects. The unit combines a GPS receiver, laser rangefinder, 3-D compass and digital camera to provide a fully integrated low-cost solution for capturing geospatial data and 3-D GIS imagery.

Leica has updated its **GeoMoS** software. Version 5.3 makes configuration easier and includes an extension for limit check messaging on displacement trends. The interval for "long time limit checks" is increased from 100 to 2500 hours (3 months) to enable limit checks on long term trends. The Point Group Editor dialog has also now been extended allowing an automatic sorting by the Hz angle.

South Survey in the UK are now offering the Spectra Precision **Ashtech Promark 800 GNSS** with Survey Pro or Field Genius software for either network or RTK solutions. The Promark 800 with the unique Z-blade

technology is a cable-free GNSS receiver with Galileo and GPS L5 tracking capability and a built-in Pacific Crest UHF radio.

October 9–11 October in Hanover Germany will see the Intergeo exhibition where many suppliers will unveil new products and developments. We invited a number of companies to tell us what they will be exhibiting and the results can be read at [www.pvpubs.com](http://www.pvpubs.com) For more about the Intergeo go to: [www.intergeo.de](http://www.intergeo.de)

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For further details and informal enquiries please contact Professor Jon Mills on +44 191 222 5393, or e-mail: [jon.mills@ncl.ac.uk](mailto:jon.mills@ncl.ac.uk).

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