



Surveying for geographical and spatial information in the 21st century

UAV's and the biosphere

Can these equations reduce range anxiety?

$P_{active} = \max(0, P_{kin} + P_{res} + P_{air} + P_{gnd})$
 In this study we focus on the influence of different DEM quality on energy consumption estimates, we are mainly interested in changes to the term related potential energy $mg\Delta h$ where m is the mass of the vehicle, g is gravity, and Δh is the elevation difference. On downhill sections potential energy can outweigh acceleration and wind resistance and excess power can be recuperated back to the battery up to a certain maximum. Therefore recuperation power is described by:
 $P_{rec} = \min(0, P_{kin} + P_{res} + P_{air} + P_{gnd})$

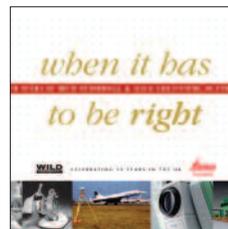
Soaring and hovering at the Berlin InterGEO



Housing: does OS and Land Registry have a solution?



The Wild-Leica story marks 50th anniversary



The problem of the part-time surveyor





50 iconic years getting it **right** in the UK



The Shard

London's skyline is changing dramatically. From 1710 to 1962 St Paul's Cathedral was London's tallest building standing at 365ft high. Canary Wharf, the Gherkin and the Shard are all new buildings on London's skyline and dominate St Paul's Cathedral significantly. Leica Geosystems has played a major part in changing London's landscape over the past 50 decades including the construction of the Shard.

Leica Geosystems proposed a system of TPS total stations, four GNSS receivers and four dual-axis inclinometers located on the rig. The system offered verifiable data from more than one system. The GNSS antennas were co-located with 360° prisms to give a constant check on GNSS positions against total station readings. The combined systems fed data into GeoMoS, Leica's monitoring software which can be installed offsite or over the web and provide early warning of any departure from design tolerances.

Great British moments, we were there.



To follow our iconic journey,
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COVER STORY

Applications for UAV's are growing. The 2014 InterGEO (see page 20), as well as a recent show in London that we'll report on next time, offered many fixed wing and rotating aircraft. Our thanks to senseFly for this striking cover image.

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Our industry is becoming more diverse with better opportunities for women. **Ruth Badley** talks to three women, two of whom have made it to the top.
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Software and rapid data capture systems continued to shine at the industry's annual mega show but UAV's were the soaring and hovering stars, reports **Stephen Booth**.
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Britain faces a serious housing shortage. So could Ordnance Survey and Land Registry data help you find a place to live? **Richard Groom** reports.
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Engineering surveying showcase 2014 ISSUE ONE

Did you get your FREE copy of *Showcase* issue 2? RICS members in the UK are entitled to receive a FREE copy upon registration or request. Just drop us an email with your full postal address and we'll pop a copy in the post to you. Overseas readers can still view the latest issue by going to: <http://www.pvpubs.com/DigitalEdition/Showcase>

NEXT ISSUE The next issue of *GW* will be January/February 2015. Copy dates are: Editorial: **01 December** Advertising: **15 December 2014**

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This issue highlights some significant issues and technologies. But we ignore the consequences – possibly to our peril – especially if they reach the hands of those who are unaware of the underlying principles.

Unintended consequences and part-time surveyors

It seems incredible that there's now only two months left of 2014. By the time you read this plans for the holiday season and New Year will be looming for many of us. So, what sort of a year has it been? We seem to have been constantly reminded of the unintended consequences of technology like the trolls of social media. Some of those consequences are benign even if they don't rank as time-saving examples of what technology should be for. I was talking to a colleague recently who proudly told me her daughters (all now over 30) don't wear watches; they rely on their mobile phones. Err? It cannot take any watch wearer more than 2 seconds to glance at a wristwatch. To reach into your pocket or handbag for a phone, switch it on, maybe enter a code. . . well I rest my case.

But it's not only mobile phones and social media that throw up unpredictable behaviours, as one of our articles in this issue demonstrates. Electric cars hold out much promise but users are aware that their range is limited; and re-charging takes time and planning (page 14). While vehicles will give some indication of the amount of charge left, whether it is enough for a specific journey will depend on more than a crude calculation based on time and distance. If the route chosen is hilly it could mean you run out of juice before your destination. A flatter route might be a better option, even if it is longer in distance and time. It all gives rise to a new human syndrome: "range anxiety". As satnavs don't have terrain models, a team from the University of Vienna has developed a series of equations that can be used in conjunction with a street map and a digital surface model to deliver route elevation profiles, helping drivers choose the most appropriate route to alleviate their anxiety.

We also have an education and professional development focus. **Ruth Badley** has spoken to three women working in surveying to find out how they've fared in a mainly male world (page 18). Technology changes have made it a little easier for women. There is more desk work and less time spent on site these days. But it can still be tough especially for families.

Richard Groom has undertaken what is a thoughtful and insightful study of how we educate, train and promote (or rather don't) the surveying profession (page 32). He raises a hitherto unmentioned problem: that of the part-time surveyor. We're not talking here about someone returning to work after illness

or following childbirth. It is the technicians or professionals from other disciplines who do some surveying. While this may be harmless in the case of simple asset data collection it can become more serious where someone drawn from another profession undertakes survey work based on a simple understanding of what the equipment can do rather than knowledge of the underlying principles of surveying.

The problem needs serious attention and the recent publication (see page 13) of the 3rd edition of the RICS *Measured Surveys of land, buildings and utilities* would seem an ideal opportunity for the profession to reach out to colleagues in construction and development to explain to them just what it is that makes being a professional surveyor so important and distinctive from other professions. We need to show them how, at a tiny proportion of the overall project cost, we can make a difference.

To round off this issue we have reports on the Berlin InterGEO (page 20) where UAV's were again much in evidence. Nearer home, London hosted the first UAV show in late October. I went thinking it might be consumer oriented, given the media attention given to idiots flying small UAVs to disrupt football matches. I was instead surprised to find over 80 exhibitors with a range of technologies and applications all aimed at the business sector. There was even a bit part for the much lamented Wankel rotary engine! We will report on that event in the next issue.

Finally, I hope you will join me in congratulating Leica Geosystems on achieving their 50th anniversary of trading in the UK (page 28). I was honoured that they chose me to write and publish their history. I could not have done it without the close assistance of **Hugh Anderson** and **Nigel Bayford** together with the enthusiastic support of **Mark Concannon**. The finished book of over 100 pages has some 350 photos and includes sections on survey technologies as well as the early history of Wild Heerbrugg and Kern of Aarau. I hope you're able to secure a copy.

As this is the last issue of the year I wish all readers a peaceful and pleasurable holiday period. We shall return in January 2015.

Stephen Booth, Editor

The editor welcomes your comments and editorial contributions by e-mail: editor@pvpubs.demon.co.uk or by post:
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Discovery brought to Life



3D laser scanning of Captain Scott's ship, RRS Discovery was undertaken over the winter and spring of 2013-2014 by Digital Surveys. All the scans were carried out in full colour and a point cloud of billions of points created. Digital Surveys' team of modellers then painstakingly traced around this data to create an accurate survey grade 3D model. Using HDR imagery collected during the scanning process, texture maps were created and mapped onto the model to create photo-realistic renderings. The company has produced a prototype virtual reality tour of the wardroom and there are proposals to create a tour of the whole vessel, making use of the Oculus Rift 3D headset.

Attention please!

The organisers have announced a call for papers for the **GEO Business 2015** Conference. Abstracts are to

be submitted on line by 17th December. Each abstract will be reviewed and a final programme will be announced in mid-February.



Evening Lectures 2014-15

RICS Geomatics lectures are CPD relevant and count towards your CPD/LLL quota as specified within RICS regulations. All lectures are free and open to all (especially students) unless otherwise specified. All lectures take place at RICS Great George Street lecture hall and are timed at 17.30 for 18.00 unless otherwise stated.

Thursday 12 December 2014

Annual Christmas Lecture, 17.30 for 18.00

title: **Geo Intelligence: embedding Geo-Intelligence in the field** (Afghanistan)

Speaker: TBC - The Royal School of Military Survey (RSMS)

Thursday 15 January 2015

Annual UK GEO Forum Lecture

Lecture title and speaker TBC

Thursday 07 May

BIM and visualisation. Speaker TBC



Papers should address the key commercial and technical issues facing the industry. This could include reporting on recent cutting-edge geospatial projects; approaches to unlock the potential of Big Data for geospatial professionals; smart GIS; data processing, presentation and applications; BIM meets geospatial; survey operations and systems integration; international and local specifications and standards; a focus on geospatial education; location intelligence and emerging technologies; asset management; hydrographic and coastal developments; boundary disputes and legal issues; or a look at geospatial developments around the world and their impact on Europe.

GEO Business takes place at the Business Design Centre in London from 27-28 May 2015. Visit www.GeoBusinessShow.com

Galileo launch hitch

The fifth and sixth Galileo satellites were launched on 22nd August, but not without a hitch. The solar wings on both satellites failed to open properly and they were launched into an elliptical orbit instead of the intended circular one. It took the ESA Space Operations Centre a week to free the wings. The satellites have since been declared healthy and fully operational, however it is not clear just how useful these satellites will be. The ESA website reports that: "The various ESA specialists, supported by industry and France's CNES space agency, are analysing different scenarios that would yield maximum value for the programme and safeguard, as much as possible, the original mission objectives."

Nottingham ESA competition win

A team at the University of Nottingham Ningbo China's

(UNNC) department of civil engineering was the only China-based entry among the winners of a competition run by the European Space Agency (ESA). The competition involved accurate tracking and positioning using Europe's current satellites and was entered by teams from across the world. The UNNC entry was, however, the only successful entry from China and made use of the department's suite of multi global navigation satellite system (GNSS) receivers that continually track at least 30 GNSS satellites currently in orbit, including those of the Chinese BeiDou system.

Survey School's future

In the UK, The Survey Association (TSA) has reached agreement with IDEX Corporation over the running and ownership of the assets of The Survey School. TSA has been running the survey training courses at the school since the 1st May 2014 and will continue to do so for the foreseeable future. It is evident that the continuation of the school is vital to both TSA and the industry and it is with this in mind that plans are being put in place to improve the current course and add further short courses to it. **Andrew Crumpler** remains as the main tutor and a second tutor is currently being sought. The future courses are already fully subscribed with the next available dates being in March 2015. A major upgrade of the IT systems has already been made and discussions with manufacturers about further support is ongoing. These initiatives guarantee that the course will be better than ever.

SebedML app schema from OGP

A move by the Oil & Gas Producers (OGP) will enable open data exchange of

geographical features. The development is seen as particularly useful on web-enabled platforms and comes following the publication of SeaBedML, an Open Geospatial Consortium (OGC) application schema based on GML (geography markup language) by the OGP's Geomatics Committee's Seabed Survey Data Model (SSDM) Task Force.

SeabedML is a GML implementation of the SSDM, a data model for the delivery of seabed survey data developed and released in April 2011. The availability of SeabedML marks an important step towards open data standards in the marine survey industry. It gives any SSDM user (e.g. oil and gas companies and their survey contractors) the choice of using an open standard for digital data exchange, in addition to the existing Esri ArcGIS File/Personal Geodatabase SSDM delivery template that is already used extensively in the oil and gas industry.

The SeabedML schema files can be downloaded from the OGP Geomatics Site: <http://info.ogp.org.uk/geomatics>

UN-GGIM: Europe created

Cooperation between the geospatial and statistical communities and formal bodies such as the European Commission, will be less fragmented and better coordinated as a result of UN-GGIM: Europe. Speaking on behalf of the European Commission at the first plenary session, **Walter Radermacher**, Director-General, Eurostat told the meeting in Chisinau, Moldova that: "By creating UN-GGIM: Europe we are closing a significant gap in European public information management." The meeting also adopted a work plan and established two working groups, one

focusing on core data and the other on data integration. UN-GGIM: Europe will report regularly to the Committee of Experts on Global Geospatial Information Management. Visit www.un-ggim-europe.org

Global carbon mapping

DMC International Imaging Ltd (DMCii) today announced the completion of its flagship project to develop a global system using Earth Observation (EO) satellite data to measure land carbon storage and how it changes over time. The project, supported by Innovate UK (formerly known as the Technology Strategy Board) was developed with consortium partners Rezatec Ltd, landscape intelligence data services provider and University College London's world-renowned remote sensing and carbon sequestration researchers. The consortium was able to develop and deliver a unique approach to assimilating and transforming EO data from different sources and resolutions to calculate tropical forest carbon stock worldwide and provide a platform for carbon fluctuation modelling.

SSTL measures ocean winds and waves

Surrey Satellite Technology Ltd (SSTL) has successfully demonstrated an innovative method of measuring winds and waves from space, using GNSS Reflectometry. This paves the way for a cost-effective satellite system supporting the maritime sector and the organisations that rely on this information. It also offers improvements to weather services and climate research.

The measurements were taken from an instrument developed by SSTL, the SGR-ReSI, (Space GNSS Receiver Remote Sensing Instrument) which is flying on board TechDemoSat-1, a

Police Scotland opt for laser scanners



Police Scotland will use five new Leica ScanStation P20 laser scanners to help reduce the amount of time that Scotland's trunk roads are closed following serious collisions. Officers are now being trained on the laser scanners, which will be located at various sites across the country to help in the examination and clear up of crash sites.

technology demonstration satellite which was launched in July 2014. SSTL's SGR-ReSI collects the signals from GPS and other navigation

satellites after they have been reflected off the ocean surface and processes them into images called Delay Doppler Maps, from which

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ocean roughness and wind speed measurements at the sea surface can be interpreted.

By flying the receivers on a constellation of small satellites GNSS Reflectometry data could be used to map all of the Earth's ocean surface with refreshed data every couple of hours. This would be of enormous benefit to the maritime industry which depends on wave height and wind speed predictions for optimum ship routing, insurance claims, oil and gas rig operations, undersea cable laying and fishing conditions.

EA reshuffles

The Environment Agency has completed a reorganisation, which sees surveying moved from regional to national management under the organisation's Geomatics business unit. Locally based

surveyors will continue to provide a service to the EA areas through the following staff: **Ben Cackett** (Leeds), **Mike Coward** (Preston), **Steve Elmore** (Huntingdon), **Richard Groom** (Hatfield) and **Kathryn Harris** (Reading).

DMCii invests for future

DMC International Imaging (DMCii), the global satellite imagery products and services provider, has made major improvements to its data centre, involving a full internal upgrade of processing systems. The new facility quadruples the company's floor space, providing much needed room for expansion. This increased infrastructure supports the growing demand for 22m resolution multispectral imagery, as well as the forthcoming commercial 2.5m panchromatic, 1m and 5m multispectral imagery and SAR data.

UAV arrest

Casual use of UAVs is becoming a problem, especially at football matches it seems. Following a UAV incident when an Albanian flag was flown by the aircraft over a match that was eventually abandoned with Serbia, the BBC reports that a man was arrested in the UK following a similar incident after a UAV was flown over Manchester City's home game with Tottenham Hotspur. According to police a 41-year-old man was arrested in the nearby Asda car park following City's 4-1 victory on Saturday 18 October. A GMP spokesman said the man was arrested on suspicion of breaching the Air Navigation Order and released on police bail for eight weeks.

Septentrio backs Altus

Altus Positioning Systems, a subsidiary of Septentrio Satellite Navigation NV, has assumed responsibility for the latter's products in North and South America. Belgian Septentrio is one of the world's leading manufacturers of high-end GNSS receivers and OEM

boards for professional navigation, positioning and timing applications.

Turner to manage Burj 2020

Project managers Turner have been awarded the contract for management of Dubai's 'Burj 2020' commercial district. The development will feature the world's tallest commercial tower, the Burj 2020. Turner comes with a wealth of experience having delivered the current three tallest towers in the world including the Burj Khalifa. Visit: www.dmcc.ae

Win for Chelsea in UK waters

Chelsea Technologies Group has been awarded a major contract by QinetiQ for acoustic noise range tracking equipment for use in UK waters. The design, development and manufacturing phase extends over a three-year period and is followed by ongoing spares provision, maintenance and support. Located at several sites, the systems will provide enhanced capability to the Royal Navy and the UK Ministry of Defence.

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EVENTS CALENDAR 2014

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GW welcomes advance details of events of interest to the Geomatics community.

Details to: editor@pvpubs.demon.co.uk

GEO Comm: The changing face of Geo
11-13 November, nr. Warwick, UK
www.agi.org.uk

Annual UK Geoforum Lecture
15 January, RICS hq London

GEO BIM
19-20 November, Amsterdam
<http://www.geo-bim.org/europe/>

SPAR International 2015
March 30-April 2, Houston Texas USA
<http://www.sparpointgroup.com/international/>

Training Days: Total Stations
24 & 25 November, Stevenage
www.pvpubs.com/Training

Offshore Survey 2015 conference
15-16 April, Southampton, UK
www.offshoresurvey.co.uk

Training Days: GPS/GNSS
26 November, Stevenage
www.pvpubs.com/Training

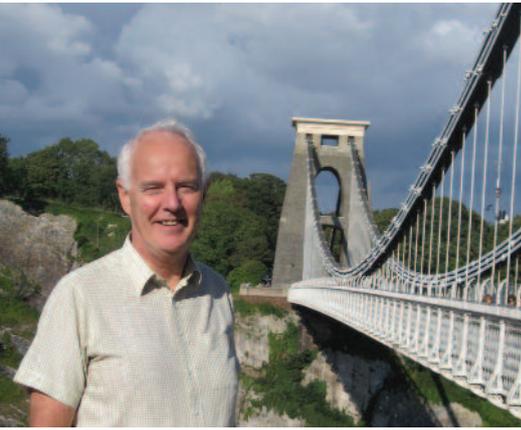
RIEGL LIDAR 2015
May 5-8, Hong Kong and Guangzhou, China
<http://www.riegl.com/media-events/events/>

HDS Symposium 2014
4th December, Bedfordshire UK
http://www.leica-geosystems.co.uk/en/Events_73707.htm?id=10146

FIG Working Week
17-21 May, Sophia, Bulgaria
www.fig.net/fig2015

European Lidar Mapping Forum 2014
8-10 December, Amsterdam
<http://www.lidarmap.org/europe/>

GEO Business 2015
27-28 May, Business Design Centre, London
www.GeoBusinessShow.com



Should we switch the focus to analysis?

As crowd sourcing and easy data capture take hold Chair of the Geomatics Professional Group, **Chris Preston**, asks if we should be focusing our attention more on data analysis rather than data collection.

So the summer holidays are long over and the “nitty gritty” of our day-to-day roles takes up all our time. It begs the question: “What can be done to make the data collection on projects that much easier?” Many have spoken about the connected office but poor mobile communications are still a difficulty with this.

What about “Crowd sourcing?” This now seems to be becoming accepted in some parts of the world for gathering data, especially when funding does not permit any other means of collection. Two applications of this have been brought to my attention recently. One via an RICS project related to the collection of parcel corner data for cadastral mapping and another that appeared on the BBC website relating to crowd sourcing of boats to map the seas: BBC news <http://www.bbc.co.uk/news/technology-26231350>. How comfortable with this idea do we feel as professional surveyors? Is data gathering not our primary *raison d’être*?

Have we been replaced by technology?

Continuing on this theme and following threads on Linked In, especially with articles from the US, there often come up snippets of thought provoking material.

How is it that we do not seem to have stronger links with our transatlantic colleagues? An article of interest I read recently by **J. Allison Butler**, a sage who claims to have been involved in geospatial matters for 40 years, has some interesting views (<http://www.xyht.com/surveying/post-licensing-world-surveying/>). He claims that “Technology has replaced the mechanical skills required to find where things are below, on, or above the Earth.” He goes on to say that although “there are still technically difficult things to do, the level of professionalism—the degree of

difficulty—expressed in the practice of surveying that exists in no other field is the discovery and evaluation of evidence.” I would be very interested in your views on this as it implies, at least to me, that we should be focusing our attention more on analysis rather than pure data collection. Are we still selling ourselves short or do we not want to focus on analysis?

Avoiding utility strikes

The last edition of *GW* had a review of PAS128 – 2014, the specification for underground utility detection, verification and location; but how are the drawings and records created by such means to be made available to the site operatives who are actually digging the ground? Would they even understand them? In an attempt to improve this, an organisation called the Utility Strike Avoidance Group was set up to produce an easy-to-follow best practice toolkit. www.utilitystrikeavoidancegroup.org.uk for the downloadable version. It is hoped that this will reduce the human suffering, costs and delays caused by utility strikes.

Beating the drum

On another subject, the satnav manufacturer TomTom has recently celebrated ten years of production with a few startling facts: 75 million sold, in 35 countries; 13 million couples avoid arguments as they can now find where they are meant to go; 35 million tourists find destinations. Every day 800 million people rely on them? I am sure **Malcolm Draper** can find a few pithy comments to add to these.

By the time you read this the RICS Geomatics evening lectures will have started so I look forward to seeing you in person or hearing from you via the usual e-mail on any of the topics discussed above.

Chris Preston welcomes your comments and thoughts so please email to the following address geochair.rics@gmail.com

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Undercurrents very own pub quiz in the last issue has shaken out lots of contestants. But who's right and who's definitely wrong?

Gunnery, chain & offset or fast food?

by Malcolm Draper, Rentalength

The autumn season at the Royal Geographical Society has got off to a great start with lectures on magic, the gentrification of London, monsoons and "cognitive maps", whatever they are. The season began with Dr **Susan Conway** talking about the arts of Tai magic and dealing with spirits in the Shan states, Myanmar and northern Thailand. The lecture showed how people in these regions, which have poor western style health care, strongly believe in these ancient practitioners and their spells. I brought a lawyer friend to the lecture who actually practices magic, or conjuring as we call it. He asked the speaker whether she thought this was something our National Health Service could utilise! Her answer was somewhat circumspect.

But by far the best lecture so far came from the BBC's Natural History Unit on capturing the drama in their latest series, *Monsoon*, currently running on BBC1. A night sequence involving a large leopard saw the animal heading straight for the rear of their vehicle from which they were filming. Orders were given to start the engine, just in case things turned ugly. Then when the beast breached their last line of defence they did what any sensible English man or woman would do: they unfurled an umbrella and shooed it away! More squeamish was a never before captured on camera event of a giant pink leech some 18 inches long eating an equally giant earthworm, accompanied by grim slurping and disgusting gulping noises.

What was it?

Well, reader **Phil Smart** certainly started something. You will recall that in the last issue we published a photo (left) of a large circular device bearing the imprint of Zeiss Jena, which

Phil had snapped in Guernsey. It has triggered more responses than we've had for a long time. The great Dr **Arthur Allan** was defeated as to its origins and purpose. He writes: "I presume you are asking about the device with the handle, because the other is a polar coordinatograph. As to the first, I have no idea."

Turning to the other respondents, let's deal first with the mischievous ones. A crack team of global chartered surveyors all came up with the same answer that Messrs Zeiss were once into making sophisticated pizza cutters and dividers. Well done



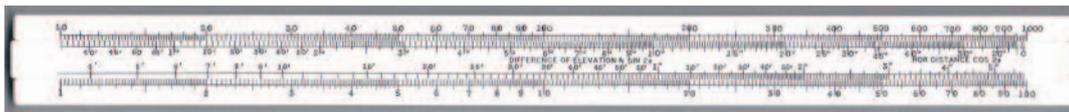
Reader **John Bradley** wants to know if anyone can identify the above devices. He knows, but is testing readers. All will be revealed in the next issue.

Nick Day, Ian Thomson and John Brock, who wrote: "antiquarian surveyors invented the pizza so that they could cut it up into triangular pieces with a curved end, because they loved anything with a compound geometrical shape. You may even say that they enjoyed calculating the number of slices and devouring what would have been regarded as a sort of Trig Pizza! That other instrument looks to me like a pizza slide rule to calculate the number of slices from the radius of the pizza and the subtended angle at the apex of the slice".

Meanwhile, **Hugh Anderson** writes under the heading, "Unidentified Karl Zeiss thingy on Page 11. . ." adding, "I feel you left out an important clue! There is an inscription "kommendes ziel" which translates as "upcoming target", which could relate [to] celestial bodies so it could be something to do with gunnery or navigation.



Above: the picture that launched a thousand emails (well not quite but a welcome postbag).



Whilst not providing an answer to our “pizza” cutter conundrum, **John Bradley** provides two more images of obscure surveying devices from his collection. Can you identify them? Answers please to Undercurrents.

So, we’re still not absolutely sure what the device was used for in surveying if indeed it was for surveying. John Bradley has referred us to the website of Leon and Ralph Lovett at [http://www.lovetartillery.com/Field Artillery Fire Direction Plotters.html](http://www.lovetartillery.com/Field%20Artillery%20Fire%20Direction%20Plotters.html) where you will see an example of a coordinatograph. Any Zeiss experts out there?

Slide rule fan

Finally, the publication of that photo triggered **Kerry Smith**, an old mate from JA Story & Partners days, to write: “Reading your Undercurrents piece on old computing machines set me wondering whether you had come across the tache slide rule. . . (is that for measuring luxuriant moustaches? *Ed*) I found it recently in my nostalgia box in the loft, tucked between the Abney Level and the Littlejohn roller grip (yes, I have one of those too!).”

It’s made by Admel, but think I bought it from Watts when I was with JAS, when we were very young. I remember that I had to order it, because they were hand engraved. I never really used it much in anger, because Redmond’s tables were more accurate, but it was a good conversation piece, although I never pulled any young ladies on the strength of it!” Kerry, leave the loft alone and get out a bit more!

Tellurometer manual wanted

John, by the way, also asks where he might get a copy of the Tellurometer CD-6 EDM manual. Your help please readers.

CORRESPONDENCE Survey marker fan

Stephen Hawkins of Laser Surveys writes: Whilst on holiday with my family in Florida I was watching the Disney Parade from a vantage point carefully selected by my highly experienced land survey skills (i.e. so I could see as much as possible and not behind a tree!), I happened to glance at my feet and lo and behold spied the attached survey marker. Isn’t it nice! Took the photo much to the annoyance of my wife and kids who couldn’t believe that I managed to stand on it! It would be interesting to know how many are installed (the number is 1097440 - which is a lot if that is the number)

It got me thinking that there are probably some other lovely crafted survey markers from around the world (although probably disappearing with the increased use of GPS) which your column might be able to bring to your readers’ attention. There must be a few. I

know there are special survey markers on Mount Rushmore for example.

OS basher

Richard O’Neill-Roe writes: “I was re-reading the GW of Jan/Feb 2014, and had a chuckle with the OS study that showed that 40% of land and property professionals, including civil engineers, etc., etc. were using out-of-date mapping information. One must ask, where are they getting the out-of-date mapping? The answer is from the OS itself. Words fail me. Licensing and paying does not ensure accuracy.

It must be said that the OS mapping embraces surveying techniques from modern GPS probably all the way through to plane tabling. The only trouble is that one never knows how the bit of map, that you are looking at, was created, and there are no paper trails to any of the data.

It is no wonder when the system of updating a map is so bureaucratic. The new map has to be sent to all those affected by line changes in the boundaries. It is not surprising that the caveat on all Land Registry plans has words to the effect that “no line on this map is necessarily in the correct position”.

Between the OS and the Land Registry, most of the opportunities to have free update data have been discarded. There have been estates where the construction mapping has been embraced. But comparison with Google Earth on a local estate near me has shown discrepancies. Obviously some site design has been going on.”

Miscellany

Seen on a Ukip poster promoting all the things the party plan to do if elected: “More GPS” Good news for surveyors but what a difference an apostrophe and a lower case ‘s’ would have made. And from the political party that wanted news readers to be in evening dress.

A letter to a paper in the US points out that if you’re planning to import a horse there’s a 60-day quarantine period to protect the country against, amongst other things, African horse sickness. And crossing a state line with a horse (or cow) requires a certificate from a veterinarian.

The writer continues: “If I am a resident of Liberia incubating Ebola, to enter the US all I need to do is present a valid visa, and lie when asked if I have been exposed to Ebola. Within hours (no quarantine required) I can be walking the streets of any city in the United States”.

He concludes: “I feel very fortunate to live in a country that values our animals so highly”.

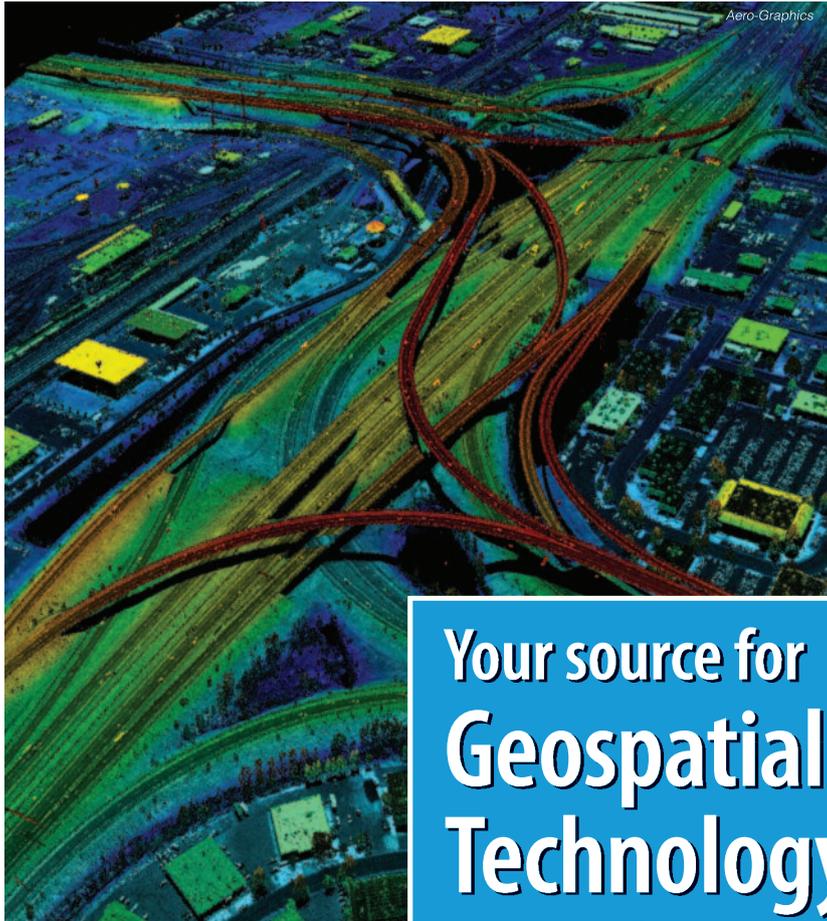


Above, left: the tache slide rule.
Above: Disney surveyors leave their mark.

“... between the OS and the Land Registry, most of the opportunities to have free update data have been discarded.”

Got a tale to tell?

Please send letters for publication by e-mail to the Editor: editor@pvpubs.demon.co.uk or contact Undercurrents, in strictest confidence if you wish (we promise to change names, places, etc to protect the guilty!), via e-mail: rentamal@aol.com



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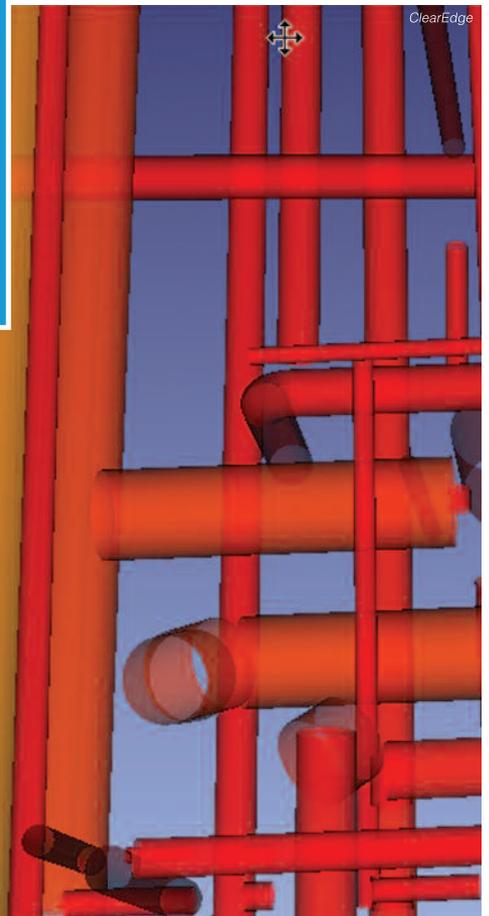
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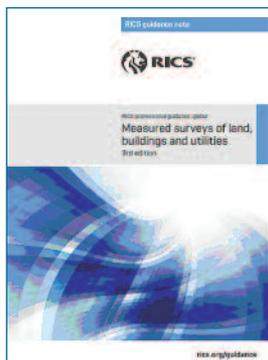
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Policy Watch: it's all about standards



James Kavanagh, Director of the Land Group introduces the long awaited new edition of *Measured Surveys of land, buildings and utilities*. This is a must read for the profession with a key focus on a "survey detail accuracy band" with applications across the globe.

It's been a very busy autumn for RICS Geomatics and related areas with a number of high profile events and outputs. We have also been heavily involved in the International Standards initiative and continue to work in collaboration with our kindred UK bodies on GeoBusiness 2015. The 2014-15 session of RICS Geomatics evening lectures are underway – more details at <http://www.rics.org/uk/knowledge/news-insight/comment/rics-geomatics-evening-lectures-2014-15/>

Thurs 11th December, 1730 for 1800, sees the annual **Christmas Lecture**. The Topic is Military Survey and Geointelligence.

Measured Surveys of land, buildings and utilities 3rd ed.

The long awaited revision of the industry standard 2nd ed. was launched at the Thurs 23rd Oct RICS geomatics evening lecture and is arguably the finest piece of geomatics industry guidance to be produced by RICS in many years. A long and often tortuous process of working group meetings, some lasting many hours, industry consultations and debate has resulted in a specification and guidance note that RICS Geomatics can be justifiably proud of. Endorsed by both CICES and TSA, the new edition places the relationship between client and surveyor at the heart of any survey contract and incorporates several new features and concepts.

The new guidance note represents a complete root and branch review of the 1997 edition

and supersedes *Surveys of land, buildings and utility services at scales of 1:500 and larger, 2nd ed.*

One of the primary changes from the second edition is the use of a 'survey detail accuracy band table', which takes into consideration client requirements for scale independent metadata and digital data handling environments. The 'banding' table features 1 and 2 sigma plan and height accuracy figures and minimum feature size as related to legacy scale. This has enormous potential for client education and in explaining the relationship between scale, accuracy, feature size and methodology. The 'banding' table is also applicable outside of the UK.

This banding table is contained within a very in-depth section 2, Survey accuracy, control, coordinate grid and datum. This section focuses on survey control and drives home the need to retain classical survey best practice principles. Survey control network accuracy is dealt with (incorporating ppm principles) as is control output, maintenance and records.

In such a fast moving and evolving technology driven environment this third edition is aimed at emphasising the importance of classical surveying and measurement good practice, which will hopefully stand the test of time. It need not be connected directly to any specific survey technology or method and can be applied generally to underpin survey products and services. This is considered particularly important in light of the growth of building

information modelling (BIM) and its wider application to the built environment. Measured building survey has an enhanced section of extended output and feature tables. Topographic survey also gets a similar enhanced section. Utility, setting out and monitoring/deformation survey sections are also included.

Another new concept within the new 3rd ed is the use of BIM (or more accurately Survey for BIM) as an output. The new 3rd ed really underlines the importance of 'output' within the context of measured survey and also features an extensive 'deliverables' section.

It is also hoped that the new edition will provide a reference document that supports downstream survey data users as well as enhanced collaboration processes such as BIM. Another change in this edition is the integration of the feature detail annexes into the main specification document according to survey application. This underlines the fact that decisions on what to include in the measured survey are critical to the success of any project relying on survey information. It is hoped this will further complement the concept of level of detail (LOD) and standardisation of metadata to support BIM among other design, build, maintain and operate (life cycle) processes.

This new 3rd edition also incorporates extensive 'recommended good practice' and 'background information' elements within highlighted boxes. Unlike many survey specifications, this document is intended to provide guidance only and is not intended to be incorporated verbatim into the text of individual contracts. In particular, it requires choices to be selected throughout thus making alternative choices inapplicable. Specification users are free to select the parts of the specification that are relevant to them to incorporate into their own specifications. However, the value of this specification is its structure, which will become familiar to clients and surveyors. Users should therefore ensure that they retain the order of clauses within their

documents and acknowledge the RICS as source where used.

But the key message from this document is that a good, agreed and fit-for-purpose measured survey specification de-risks a project and must be seen as an essential element by clients.

As you all know, there are a number of other RICS publications related to the full range of land surveying/ geomatics services, including:

Code of measuring practice, 6th edition (2007)

EDM calibration, 2nd edition (2008)

Guidelines for the use of GNSS in land surveying and mapping, 2nd edition (2010)

Terms and conditions of contract for land surveying services, 3rd edition (2009)

The new 3rd ed can be sourced at www.rics.org/geomatics

International Standards

Many of you will be aware of the significance of the development of IPMS and the other standards we have been exploring, the issues of Development Land and the inappropriate use of measurement or more likely misuse of mapping information. RICS has been 'vox-popping' at various meetings and events and has gathered quite a portfolio of horror stories – I'm sure we all have our own personal 'tales of woe' on this issue and it does have international application. Like all the best standards, it's quite simple: measurement should be appropriate for the value of the development. We all know the issue of an extract from a national mapping product becoming photocopied then scanned then inserted into a development appraisal then used to measure dimensions resulting in development that does not fit the site with all of the ensuing costs and liability. We have called it the 'International Development Land Measurement Standard' (IDLMS) and have formed a small working group under the auspices of the Land & Resources Global Board. If any geomatic members have any personal experiences of 'when development doesn't fit the site' then do please send them in to jkavanagh@rics.org

DEMs reduce Range Anxiety!

By Anita Graser, , Johannes Asamer and Melitta Dragaschnig

Electric cars are growing in popularity and especially at the top end of the luxury market. But every driver must have asked him or herself a fundamental question. This team from the Austrian Institute of Technology in Vienna have an answer.

Will the battery last till I get home? This will have been a familiar thought for anyone who has driven an electric vehicle. This article describes how digital elevation models will help with estimating fuel consumption.

The electric car problem

Rising prices for fossil fuels and concern about the impact of greenhouse gases from combustion engines has led to the development of new vehicle technologies. Particularly, electric vehicles have received a lot of attention in research and development. Their general acceptance and sales numbers, however, are still low with shares of 0.3% of cars sold in the US in 2012 and 0.21% of cars sold in Western Europe in 2012. One important problem electric vehicles face is their limited cruising range, leading to what is known as "range anxiety". To address this problem, it is crucial to provide the user with information about the current energy status and to reliably predict the energy required to complete planned routes. It is therefore necessary to develop solid methods to estimate energy consumption for routes prior to starting a trip.

In this study we focus on the geographic information used in energy consumption models and evaluate the influence of the quality of different DEMs on energy consumption estimates for routes in the city of Vienna.

DEM data

This study compares the NASA SRTM, EU-DEM and a DEM of the city of Vienna as illustrated in Figure 1, which were used to estimate the energy consumption for 16,500 randomly generated routes.

NASA SRTM V3.0 (from now on referred to

as SRTM3.0) was released on November 20th, 2013. SRTM3.0 has eliminated all voids found in previous versions with fill primarily from ASTER Global Digital Elevation Model Version 2, and secondarily from USGS GMTED2010 or USGS National Elevation Dataset. SRTM3.0 data is provided in WGS84 (EPSG:4326) with one-arc-second postings for the US and its territories, and three-arc-second postings (approximately 90m) for the world. (NASA 2013)

The EU-DEM is a digital surface model covering Europe, created in the course of the Copernicus programme, funded by the European Union. The data was released in November 2013 (INSPIRE FORUM 2013) and is provided in EU-LAEA (EPSG:3035) at a resolution of 25m. EU-DEM is based on SRTM and ASTER GDEM data. The data is currently provided without formal validation. Publication of an independent statistical validation has been announced for the course of 2014.

The open government DEM dataset published by the city of Vienna (from now on referred to as Wien-DEM) is based on surface points, break lines (slope edges, shoreline), and airborne laser scanning data. It was provided as a regular vector point grid in WGS84 (EPSG:4326) and MGI/Austria GK East (EPSG:31256) at a resolution of 5m but has since been replaced with a 10m raster version. The DEM is regularly updated with new data. Artificial structures such as houses and bridges are excluded from this DEM. The data is provided free of charge under a Creative Commons licence.

To achieve a good spatial distribution of test routes within the analysis area, we first generated a hexagonal grid with a cell size of 1km² covering Vienna. The set of random test routes was then generated by overlaying the hexagonal grid to the road graph, i.e. the GIP

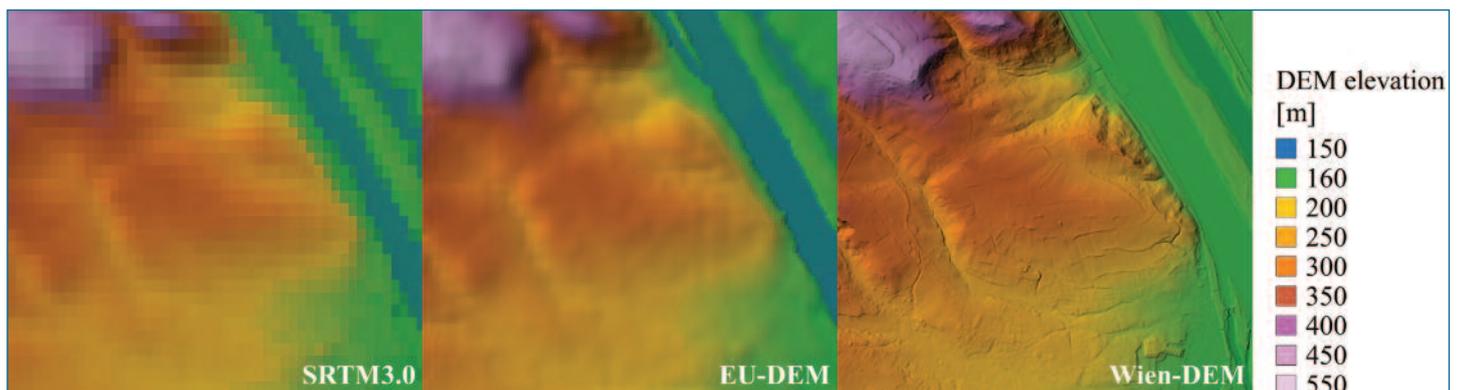


Figure 1: Representation of the hills and river side of northern Vienna in all three DEMs

street network published by the city of Vienna. The road network is defined as a graph $G = (V,E)$, where the set of vertices V represents the intersections and the set of edges E represents the street segments. For each neighbouring pair of cells, ten unique pairs of randomly selected graph edges E are created. Cells containing fewer than ten edges are excluded from the analysis. The minimal air-line distance between edge pairs is defined as 800m, in order to avoid too short routes which would distort the analysis results.

For each edge pair, the central points of both start and end edge were then extracted and used as input for a shortest path routing. Each route was represented by an ordered set of all geometry nodes of the graph edges comprising it. Subsequently, route elevation profiles were generated by extracting the DEM values at the node positions using nearest neighbour sampling. The resulting routes have a mean length of 2,109m. Only routes which are completely covered by all three DEM datasets were used in the following route energy consumption estimation.

Energy consumption modelling

To estimate energy consumption on a route, we use a vehicle longitudinal dynamics model based on *Ehsani et al. (2004)*. This model estimates the required energy on the drive train. Assumption of efficiency rates for the transmission, electric motor, power electronic devices and battery leads to the required electric energy used for travelling a certain route. It is worth noting that the maximum efficiency of combustion engines is limited to a small operating range for torque and speed. Since this is not the case for electric engines, efficiency is much less dependent on current speed and torque and therefore can be assumed as rather constant.

The total power estimate is composed of power to overcome acceleration resistance (P_{kin}), rolling resistance (P_{res}), wind resistance (P_{air}), and elevation changes (P_{pot}) as well as the power (P_0) for appliances such as heating, air conditioning and lights. The required power on the drive train for a moving a vehicle therefore is:

$$P_{drive} = \max(0, P_{kin} + P_{res} + P_{air} + P_{pot}). \quad (1)$$

Since in this study we focus on the influence of different DEM quality on energy consumption estimates, we are mainly interested in changes to the term related to potential energy $mg\Delta h$ where m is the mass of the vehicle, g is gravity, and Δh is the elevation difference. On downhill sections, the potential energy can outweigh acceleration, rolling and wind resistance and excessive power can be recuperated back to the battery up to a certain maximum. Therefore recuperation power is described by:

$$P_{rec} = \min(0, P_{kin} + P_{res} + P_{air} + P_{pot}). \quad (2)$$

From (1) and (2) it is clear that either P_{drive} or P_{rec} is not null, which means that the electric engine can be operated either as a motor or as a generator with different conversion efficiency rates. The total energy which has to be provided by the battery can be described as the difference between total energy spent and recuperated energy:

$$E = [P_{drive}/\alpha_{drive} + \max(-P_{max}, P_{rec} \alpha_{rec}) + P_0] \Delta t, \quad (3),$$

where α_{drive} and α_{rec} are the efficiency rates of the power train (composed of efficiency rates for motor/generator, gear unit, charging and discharging) depending on the direction of energy flow, and Δt is the time span. If E is negative, energy will be restored to the battery. In this study, α_{drive} is set to 0.78, α_{rec} to 0.77 (*Schwingshackl 2009*) and the maximum recuperation power P_{max} is 10kW. The value for α_{rec} is dependent on the type of vehicle and strategy for regenerative braking.

This energy consumption model (3) has been applied to 16,500 routes which are covered by all three DEM datasets. For this evaluation, a typical average urban travelling speed of 35km/h is assumed. The speed is kept constant on the whole route to keep the non-elevation-dependent parameters fixed since this evaluation focuses exclusively on the impact of DEM quality on energy estimates.

Energy estimates

Table 1 shows a comparison of indicators for the estimates based on all three DEMs. The data shows that the minimum energy consumption values for all three DEMs are negative, which means that electric vehicles would be able to recuperate energy on some of the test routes. The mean energy consumption ranges between 13.01 and 15.06kWh per 100km with the lowest values based on Wien-DEM and the highest values based on SRTM3.0. The low overall energy consumption values can be attributed to the constant low vehicle speed of 35km/h which is used for the energy estimation.

	SRTM3.0	EU-DEM	Wien-DEM
Min kWh per 100km	-8.76	-12.50	-14.67
Max kwh per 100km	67.29	64.73	66.37
Mean kWh per 100km	15.06	13.40	13.01
Standard deviation kWh/100km	6.41	6.19	6.31
Median kWh per 100km	13.86	12.69	12.36

Table 1: Energy consumption estimations

Comparing the EU-DEM and SRTM3.0 DEMs against the Wien DEM (the highest resolution model), we find that mean energy estimates tend to be higher by 0.39 and 2.05kWh, respectively. This corresponds to errors of 2.9% and 15.8% relative to the Wien-DEM mean energy consumption rate of 13.01kWh per 100km.

“... values for all three DEMs are negative, which means that electric vehicles would be able to recuperate energy on some of the test routes.”

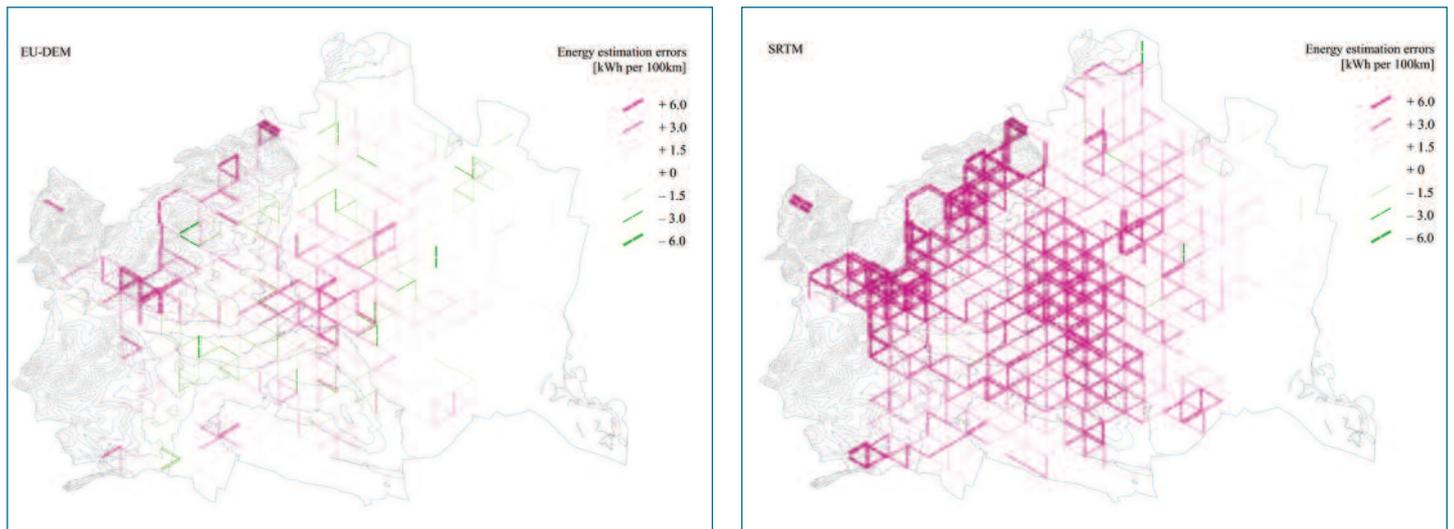


Figure 2 Spatial distribution of energy estimation errors based on EU-DEM and SRTM3.0. The background of both maps shows contour lines at 25m intervals derived from Wien-DEM which serve as an indicator of the terrain characteristics in the different regions of Vienna.

“...Wien-DEM which is smoother and overall more realistic, since roads for vehicle traffic are built with moderate slopes rather than abrupt changes.”

The evaluation so far represents a summary of the results for all routes within the analysis area. Since DEM error values correlate with terrain characteristics such as slope and aspect, we also compute the spatial distribution of energy estimation errors of the EU-DEM and SRTM3.0 DEMs (Figure 2).

Each line segment in Figure 2 represents the mean energy estimation error of the routes between the corresponding ordered pair of grid cell neighbours. The errors are dependent on the sequence of start and end cell. Therefore, all lines are drawn with an offset to the right from the centre line to distinguish between the two possible directions. Overestimation is shown in pink, underestimation in green. Wider lines represent bigger errors.

The statistical analysis results show that energy estimates tend to be higher when the estimation is based on EU-DEM or SRTM3.0 than when the estimation is based on the high-resolution Wien-DEM. The reason for

this becomes clearer when we compare individual route profiles for the same route on different DEMs. Figure 3 shows profiles from all three DEMs for one of the test routes in the north-western hills. The profiles based on EU-DEM and SRTM3.0 clearly exhibit more elevation changes – including steep drops and rises – than the profile based on Wien-DEM which is smoother and overall more realistic, since roads for vehicle traffic are built with moderate slopes rather than abrupt changes. The error based on EU-DEM is generally smaller than the error based on SRTM3.0 because the SRTM3.0 profile exhibits bigger and most sudden elevation changes.

In the spatial analysis of error distributions, two regions exhibit higher errors than the rest of the analysis area: the hills in the north-west, and the city centre. These results are consistent with other studies on DEM accuracy which show that SRTM error values correlate with terrain characteristics such as slope and aspect and

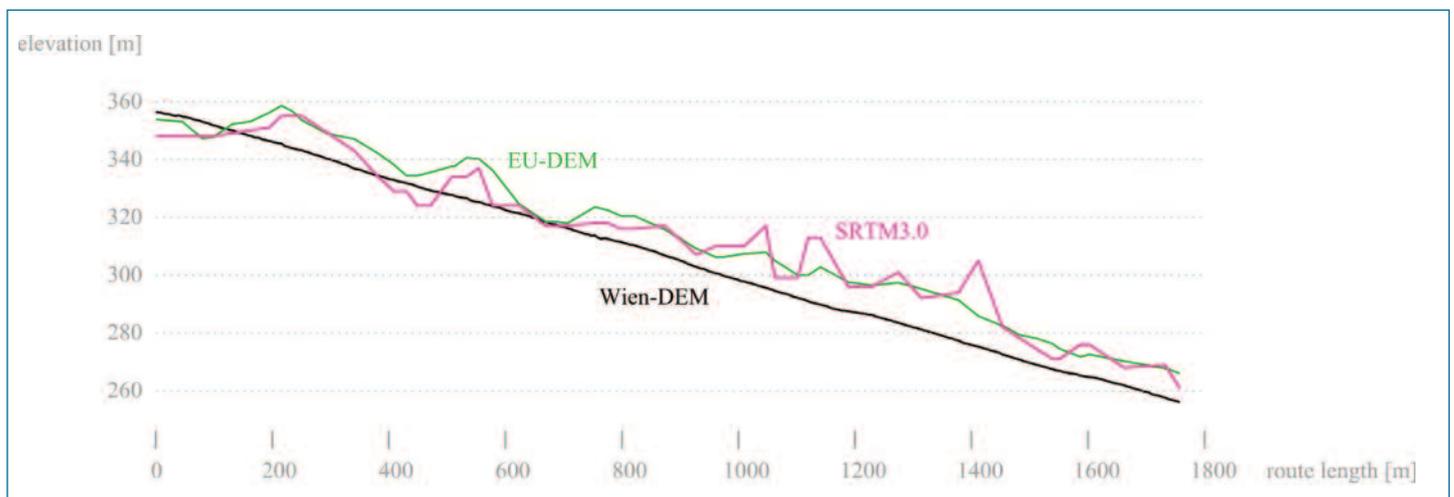


Figure 3: Route profiles of a sample route, energy estimate difference: +12.96kWh (EU-DEM) and +31.94kWh (SRTM3.0)

that DEMs built from radar data are less accurate in urban and forested areas.

Conclusion and future work

In this study, route elevation profiles were generated using nearest neighbour sampling to extract elevation values for the route geometry nodes. Sampling at geometry nodes is the most commonly used approach described in related studies but most of them do not report on which sampling method was employed. The current study therefore serves as a base line reference. Further work will look into possible improvements by sampling elevation values in regular intervals along the route and by applying more sophisticated methods such as bilinear re-sampling.

Currently, one open issue with route profiles derived from Wien-DEM is that they contain sudden drops and jumps at bridges and tunnels since the DEM does not include artificial and underground structures. To handle this issue more gracefully and improve energy predictions for such routes, alternative approaches will be implemented and evaluated.

Further work is planned which will compare energy consumption estimates to data collected by test vehicles. Battery state

of charge and capacity information will be used to derive ground truth data about energy consumption. The model described above will then be applied to the vehicle GPS data which makes it possible to compare estimation results and observed energy demand.

Acknowledgements

This research was supported in part by the Austrian Climate and Energy Fund of the Federal Ministry of Transport, Innovation and Technology within the "Electric Mobility Flagship Projects" program (project "emporA 2") and the KLIEN initiative of the Austrian bmvit (project no. 839478 *Crossing Borders*).

This article has been abridged from a paper *How to Reduce Range Anxiety? The Impact of Digital Elevation Model Quality on Energy Estimates for Electric Vehicles*, presented at the GI_Forum 2014 conference at the University of Salzburg. The full paper can be downloaded from:

http://hw.oeaw.ac.at/0xc1aa500d_0x0030d58f.pdf

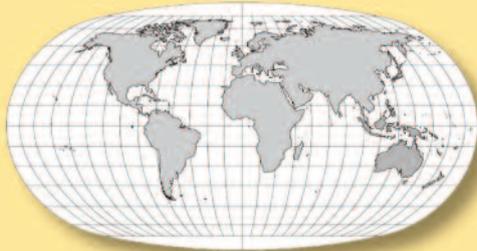
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Women and Surveying

by Ruth Badley

Increasingly women are entering the geospatial sector, with many (though not all) holding higher degrees. As the industry becomes more diverse with new opportunities, **Ruth Badley** talks to three women of their experiences, including two who are running survey companies, in what is otherwise a male-dominated profession.

Sue Stewart: "Laser scanning technology, for example, is making surveying a more attractive career option for women than it used to be. ..."



Sue Stewart is a director of Laser Surveys, which operates from offices in Worcester and Hornchurch, Essex. The company supplies Ordnance Survey mapping and a range of products online as well as providing topographical surveys, floor plans, elevations and sections, laser scanning, 3D modelling, underground services surveys, ground penetrating radar surveys, drainage connectivity and CCTV drainage condition surveys, GPS surveys, re-bar surveys, precise level monitoring and verified photographs.

What is your background?

I have no formal training as a surveyor but have gained my surveying knowledge through 27 years of experience in dealing with client enquiries, project managing survey contracts and my interest in new survey technologies and maps. My responsibilities include the company's finance, HR, new business development, sales and marketing, quality, health and safety and environmental management.

What significant changes have you seen in the industry?

Advances in technology are bringing about unexpected changes. Laser scanning technology, for example, is making surveying a more attractive career option for women than it used to be – for very practical reasons. Fast data capture in the field, with the rest of the job being completed in the office, makes the job much more flexible and compatible with part-time working and family life. We work all over the UK and it used to be the case that if we had a big topographical and measured building survey to complete in another region, it could involve several days away from home. This simply wasn't practical for someone working full time with young children or for part-time working – the job can't be halted because the surveyor doesn't work on a Wednesday! Smarter, faster ways of working are making a real difference to groups of people that might previously have thought a job in survey was not suited to their situation.

Are you seeing an increase in applications from young women?

Women are still few and far between in the survey world, although I am pleased to say that we have one young female trainee who recently joined our Hornchurch Office and we are looking for another to join our Worcester Office.

What advice would you give a young person thinking of a career in surveying?

From my experience I have a few questions that I always ask myself when I consider taking someone on, so I hope that sharing these will help young people understand what an employer looks for in a trainee surveyor and some of the personal qualities and background experience that give a positive impression at interview. They are:

1. Has this person taken time out to research what a career in surveying would actually involve?
2. Has this person spent time looking at our company specifically and come armed with relevant questions about what he or she has read about us and the work we are doing?
3. Would this person be a confident presence on site? Does he or she have good communication skills and the ability to be appropriately assertive if required?
4. Does the applicant show a good level of enthusiasm and willingness to learn in order to progress?
5. Does he or she understand that the hours will often be long, there will be a lot of travelling and that he or she will be required to stay away from home for short periods of time? The rewards are that they will be surveying different and interesting places and learning about, and using the latest survey technologies.
6. Does the applicant appear to be helpful and responsible? Have they had any experience of volunteering or do they have a part-time job they can talk about with enthusiasm?
7. Is he or she someone who likes to participate as part of a team and to be challenged? Have they taken part in the Duke of Edinburgh scheme or similar?

ANNE KING, is managing director of Kingsland Surveyors Ltd, based in Surrey. Their services include topographical land surveys, measured building and architectural surveys, setting out, engineering surveys, rights of light surveys, photogrammetric measurement and 3D modelling.

How was the business started?

My late husband Geoff set it up in 1996. He had worked in the industry since leaving school but when faced with possible redundancy he took the bold step to set up his own survey company and recruited many of his surveyors from overseas as the business grew. A career in surveying was much more popular in countries such as Poland, Australia and New Zealand for both men and women, but less so in the UK. It

has to be said that some of our best surveyors have been women – they have shown themselves to be logical, practical, hardworking, multi-taskers and real team players. Geoff offered UK school leavers opportunities to join as junior trainee surveyors and provided sponsorship to attend college day release surveying courses but there was only interest from male applicants, although in terms of more senior office-based roles there were several very effective female members of staff.

How did you become involved?

When Geoff died suddenly and unexpectedly at the start of 2007, I took over the running of the business. The support and commitment I received from the staff and the key department managers helped me through that very difficult time, ensuring continuity so the successful business model Geoff had formulated could be taken forward in his memory. We were already committed to relocating to new offices and it was a major challenge to get the infrastructure of the business up and running so we could continue to keep everyone motivated and busy and especially so against the backdrop of a recession. I am not a “hands on” surveyor but then there are plenty of business owners that don’t work on the factory floor as such. Running a business is all about good organisation, communication, forward planning and ensuring the figures add up. On any given day I could be tendering for new work, programming and scheduling jobs, QA drawings, communicating with staff and clients, attending meetings and monitoring suppliers.

What is the biggest challenge in running a survey business?

Finding, recruiting and retaining good staff. We are planning to take on a couple of junior surveyors this year but training takes time and investment. Staff are key to any successful business and it is important to value and retain good employees. Our work requires surveyors that are team players, so hiring people with the right personality is also very important. The finished product is the survey drawing and our surveyors are key to providing our technicians with the right level of information needed to produce accurate, easy to interpret, attractive drawings. The construction industry is currently very buoyant and there are plenty of job opportunities in surveying, but it is my perception that there is a real shortage of good surveyors and applicants with the right skill-set coming forward.

Do you see this situation changing?

There are some positive signs and the recent strategic initiatives in education should encourage more young people into the industry. I really hope they have an impact because there aren’t many careers that can offer such an interesting variety of work and challenges. You get to work in many different

locations with opportunities to travel and work abroad and no two days are ever the same.

EMMA BLAKE joined Atlantic Geomatics (UK) Ltd, Cumbria as a CAD technician and survey assistant in January 2012.

What attracted you to a job in survey?

I studied architecture at university, and worked for 18 months in practice before returning to study for a graduate diploma. At the end of my studies I’d had enough of city life and wanted to move back home to Cumbria but I struggled to find work as an architect. Surveying requires some of the same knowledge, allows me to use the CAD skills I have developed and also to learn new ones, through assisting the surveyors in the field. It was quite challenging to get up to speed with using equipment like total stations and GPS and also the processing software but learning on the job is by far the best way.

What sort of projects do you work on?

I spend about 80% of my time in the office and 20% on site. I tend to work on short projects so there is a great variety, with something new every couple of weeks. Recent work includes an overhead wire survey near Preston, a river bank survey in the catchment area of the River Aire, for flood risk management purposes and an elevation of a hotel building near Keswick.

What do you enjoy most about your job?

Working outdoors on a glorious day in a beautiful location is great. I get to see a great deal of the Lake District and there are also opportunities to travel further afield. I like the fact that I am involved in the whole process – from taking the measurements on site, through to the presentation and deliverable. Working outside is less good in the winter but I am a local farmer’s daughter so I am used to being outside in all weathers.

Does being from the locality have any other advantages?

Yes. It is quite often the case that we need access to farmland and coming from that background myself I can assist with that approach. I know that farmers really appreciate it when you take the time to explain what you are doing. I think those small things go a long way to give a good impression of the survey industry in rural areas. The other advantage for me in working locally is that I can still help out on my parent’s farm at evenings and weekends.

Where do you see your career developing?

I still enjoy the creative design side but now I have more technical experience maybe there is a role for me in the future as an architect’s technician or possibly in project management.



Anne King: “. . . some of our best surveyors have been women – they have shown themselves to be logical, practical, hardworking, multi-taskers and real team players”.

Emma Blake: “I like the fact that I am involved in the whole process – from taking the measurements on site, through to the presentation and deliverable”.



• This article was commissioned by The Survey Association (TSA), the trade body for commercial survey companies in the UK. The author, Ruth Badley is a freelance journalist and PR consultant. She is based in Harrogate, North Yorkshire and works with a number of businesses and organisations in the geospatial sector.

InterGEO: 17,000 visitors, 500+ stands... where do you start?



Above: the InterGEO press conference was revealing.

UAVs as platforms or systems were very much the fore at this year's InterGEO. But so was software, reports editor **Stephen Booth.**

In one of the six exhibition halls of the German Intergeo there is a display tracing the history of the event. Beginning in 1986, a splendid poster board of wood and other materials (what I think the art world calls an installation) for each year marks appropriate technologies and locations. He literally pulled all the stops out for Leipzig (2007) with a musical tribute to JS Bach and an organ keyboard! Chatting to one of the organisers staff he told me it is an annual labour of love by a retired employee. Respect! Too many companies ignore their history in the digital age, perhaps believing that whatever is recorded on disk will stay around forever. Forget it! Unless an employee is given the job of properly archiving data it will gradually disappear as staff come and go and computers fail or are replaced.

I have been coming to Intergeos for more than a decade. The event is a moveable feast that changes, alighting on a new German city each year. Frankfurt, Munich, Bremen, Karlsruhe. . . I was beginning to think that the list was almost endless but this year we returned to Berlin, last visited 14 years ago. Like Ikea, even if the displays change each Messe (exhibition) centre looks the same, so much so that I was chatting with some colleagues who regularly attend and none of us could remember where we had been the previous year! A check with the organisers

revealed it was Essen, a perfectly pleasant town in the Ruhr but perhaps too small to have stuck on the personal radar.

Many venues too often involve a route march from a station or bus stop. Hanover was particularly bad. Fortunately, this year it was an easy step from the S-Bahn (regional train station) to the entrance. It is after that the challenge can begin. My best advice (which too often I forget!) is to grab a coffee, sit down and study (intensively) the plan and try to understand how the various halls are linked before setting forth.

Enter any of the six halls in use this year and you're immediately in a busy, bustling scene of demos, enthusiastic stand personnel thrusting leaflets and trinkets on you. As well as gaggles of people. Worst are those who insist on holding ad hoc meetings in the middle of an aisle!

This year marks the 20th anniversary of Intergeo. The event that began in 1986 as "Geodatentag" – the German Geodesy Day – has become a three-day event with a conference, over 500 exhibitors and attracting over 17,000 visitors from more than 30 countries.

Once again it's up in the air

Last year we reported that UAVs seemed to be everywhere. Impossibly, this year they seemed even more prevalent. The Intergeo TV channel constantly broadcast an interview with an operator demonstrating his helicopter UAV in the main entrance; his job title proudly proclaimed "Ascending Technician". A possibly useful title in case the second coming should begin during our sojourn.

Fortunately the market for this ubiquitous technology is beginning to settle between those who offer an end-to-end system, like SenseFly or Aibotix and those who sell the device as a platform with a specified payload leaving you to chose your sensors: the system integrators choice. And there are plenty of players in the sensor market. UK supplier OxTS is typical. They make a number of very neat small combined GNSS and inertial navigation units that can keep a UAV stable and on course. The xNAV weighs in at 365 grams thereby not eating too much into a typical UAV payload budget of 5-10kgs. Their xOEM500, which is just an OEM board, is even lighter at 120 grams.



Above: an array of displays mark each year of InterGEO since it began in 1986 as Geodatentag.



Left: a therapeutic jigsaw is just the job for stressed-out visitors!

Bio inspiration for UAV

At last year's Intergeo SenseFly launched the eBee fixed-wing UAV with a choice of integrated sensors including RTK GNSS. This year they've entered the helicopter drone sector with the eXom. My view is that it is this area that surveyors are more likely to find regular work – close-up inspections of inaccessible or expensive to reach structures like high-rise buildings or the underside of bridges, are obvious apps.

Talking to SenseFly CEO **Jean-Christophe Zufferey**, he is intrigued by insects. They may have small brains but they are incredibly manoeuvrable and totally focused on what they do. The eXom is therefore "bio inspired". Indeed there is more than just a hint of the insect world in its design. A large multi-sensor "eye" at the front uses a combination of thermal camera, HD video and hi-res still images that are fed back live to the ground. Position is maintained by ultrasound and photogrammetry from the video and still imagery. Propulsion comes from four rotors within protective carbon-fibre bands.

SenseFly is rapidly growing since being acquired by Parrot two years ago, a company with hitherto no presence in the geo sector. From a standing start in 2009 Jean-Christophe now leads a company of 80 employees.

Right: the bio inspired SenseFly eXom is securely pinned whilst another hovers in the background behind a safety net.



Leading players

The major players – Trimble, Leica, Topcon – each approach Intergeo in different ways. For Leica, the event is always pitched towards the German market sector (over 80% of visitors will come from the German-speaking world). This year marked a stronger focus on this demographic for Trimble too, whose German dealer HHK's stand was close by. Neither Trimble or Leica held press conferences and in both cases it was not easy to get press kits (not a unique problem as I was to experience with a Chinese survey equipment supplier who had invited me to his stand in advance but

“They may have small brains but they are incredibly manoeuvrable and totally focused. . .”

INTERGEO PRESS CONFERENCE

The platform line-up this year included **Bruce McCormack**, president of EUROGI whose conference was taking place along side that of DVW e.V., the German Society for Geodesy, Geoinformation and Land Management. McCormack introduced the organisation which has just 23 members. But they are state mapping and GI organisations so represent a somewhat larger constituency than at first sight. Their current focus is on developing Europe wide policies to influence the EC Commission on topics such as open data, linked data, SME's, the Internet of things, urban and regional development. This may seem a little prosaic but just remember that by 2012 the market for geo data was already a third of the value of the world airline industry; and with demand growing, according to McCormack, by 30% a year. They are "core components of the digital future" added Prof **Karl-Friedrich Thöne**, president of DVW.

Responding to questions on technology trends, Trimble's **Erik J. Arvesen**, vice president of the geospatial division, spoke of the "technology lens" that had seen the launch of RTK GPS 20 years ago spawning a wide array of other

technologies. "Tying it all together is now the key challenge. Our technologies are at the forefront of innovation" he declared. Why, Trimble even held "hackathons"! He did not reveal whose software or data they were hacking. Hopefully it was not sponsored by the CIA.

For **Jürgen Dold**, president of Leica Geosystems International, customers expect consolidation of skills. As engineering companies acquire surveying skills they become multi-disciplinary thereby increasing interoperability and workflow. But just remember, he emphasised, that despite UAVs being a key push "the platform is not the message".

I questioned both industry pundits on whether we were seeing the slow death of the dedicated survey controller now that people increasingly use apps on phones and pad computers.

Arvesen acknowledged that he was an advocate of 'bring your own device' but in apps like tunnelling and cadastre there was still a need for dedicated devices. Nevertheless, new devices were appearing all the time but he couldn't see them eliminating the need for dedicated ones.

For Jürgen Dold, "because we've

done it for 90 years, it doesn't mean we'll do it for another 90 years. We're constantly modernising the software for our devices as well as for mobile phones and iPads". But these devices can die and even fall in water (as this reporter knows to his cost when he discovered the "IsWim" app didn't work!). Nevertheless, change will be driven by customers' habits and choices.

When would we see a consolidation of data formats, asked another questioner? **Jürgen Schomakers**, director of Esri Deutschland, is firmly of the view that we should be serving information to devices, not downloading data. Dold acknowledged that they had to cater for both markets. Young people increasingly expect an app but there is a drawback. To do this you have to build an interface into the native data format which, slows down processing. He was firmly of the view that dedicated devices would continue to be necessary in extreme environments where temperature, water and dust restrict the use of consumer devices.

Arvesen concurred with this view, adding that for the dedicated device "speed of sensor to information means confidence in the solution. "It's what customers look for".



Above: Topcon's latest mobile mapping laser scanner, the IP-S3

was totally unprepared). There seems an excessive reliance on emails and downloads.

Topcon was a different matter. They held an interesting press conference presided over by Ian Stilgoe, a Brit who has risen in the company to Director of Geomatics. This year the focus was on the "democratisation" of data, which according to Stilgoe is where we are heading from the old world of point capture, 2D and visualisation. I'm sure his analysis is correct but how much data will be democratised remains to be seen.

Topcon's strategy is on improving workflows through its cloud offering, MAGNET, and a closer relationship with Autodesk and its BIM strategy, aimed at reducing waste in construction by 30%.

One product that should contribute to this is a little trumpeted device launched last year just after the 2013 Intergeo (delays in production?). The LN-100, which looks like a small tube-like laser scanner, may be the next or perhaps the last incarnation of the total station. "That's what all total stations will look like one day!" quips Stilgoe. Topcon's is a very different strategy to Leica's. This is not a combined scanner, GNSS and total station but an EDM based device aimed at the internal construction trades to maintain line, level, position and angle. The LN-100 is self-levelling and ranges to prisms (usually stuck on). Watch out for it on a site near you!

Below: the Leica Viva TS11 KUMONUS with a crack scale reticule is designed for concrete crack monitoring.



There is a growing dichotomy between those who see the miniaturisation of the laser scanner as the way forward and those who believe

imagery and a photogrammetric solution is the right path. Topcon is in the latter category and their latest imaging total station, the DS-200i is the fourth generation that uses the company's visualisation technology. Meanwhile their scanner is updated to the GILS-2000 along with further improvements to the Hybrid range of GNSS receivers. The mass data collection mapping system, the IP-S3 HDI (first adopted by Google for their StreetView imagery) is now in its third generation. Topcon of course also owns Sokkia, however we were assured that

the dual branding will continue in many markets. Indeed, this is not just branding as Sokkia continues to make its own range of survey products, the latest of which is the GNR5 which utilizes 452 channels optimized to track the full GNSS spectrum and can assign any visible signal to any available receiver channel.

Topcon were also showing the latest version of their UAV, the fixed-wing Siriuspro is a cooperation with MAVinci GmbH whose precision timing technology with Topcon's GNSS (sub-centimetre grade L1/L2 GPS/GLONASS RTK) offers 2-5 cms accuracy without ground control.

Around the stands

On the show floor as you wander from hall to hall there is much to see and to much to take in, even over two or three days. So friends and colleagues are useful in alerting you to something interesting.

The BBC News Channel is currently plugging a series on China and whether it can become an innovator as well as a producer of technology. An interesting proposition. Before you can innovate however I would argue that you need to master sales and marketing. Too many of the Chinese exhibitors at Intergeo do not present an inviting front to visitors. They sit at tables engaged in intense conversation with each other rather than stand and invite contact with the strolling visitor. Nevertheless, the snappily named MILESEEEY company manufactures a range of laser distance meters, the latest of which includes what they claim is a world first, a green laser pointer in addition to the red dot EDM beam. Presumably someone was waiting for it.

Cracks show from this total station!

Amongst the major suppliers Leica Geosystems announced a range of updates and new products. The UAV department, Aibotix now has a drone that can be kept in position and tracked without GNSS via the Leica Nova MultiStation. Why do I think that's a bit of a sledgehammer? Admittedly they suggest this is a solution for inspection inside large buildings like aircraft hangars but that's a lot of expensive technology. Surely the UAV ought to have some form crash avoidance system?

It seems amazing that it is now 15 years since I was in Heerbrugg and had a sneak preview of what was coming for the millennium year. The first airborne digital camera system was incredibly expensive and processing was slow. But it began a long journey to today's systems like the Leica RCD30 80Mpx camera and the ALS80 LiDAR mapping solution with a scanning pulse rate of 1MHz. For hydrographic applications this was the first Intergeo outing for the Chiroptera topo-bathy LiDAR system that simultaneously captures the full waveform in both the 35kHz bathymetric channel and a 500kHz topo channel. It can penetrate depths to 15 metres and also integrate with the Leica

RCD30 camera. UK based Pelydryn Ltd which specialises in the acquisition of airborne bathymetric LiDAR worldwide is one of the first to buy the Chiroptera .

Other updates announced included a GNSS, the Leica Viva GNSS Unlimited allowing for easy upgrade of the sensor as the satellite segment continues to grow; new versions of the point cloud software Cyclone and a web based real-time version of the monitoring software Leica GeoMoS Now! Also announced were a range of updates to the Leica iCON construction instruments range.

One of the more interesting debuts however was Leica Viva TS11 KUMONUS, a concrete crack monitoring tool built around a total station equipped with a concentric crack scale reticule. Ideal for building façades, dams and other surfaces subject to potential deformation. Existing owners can have the reticule retro fitted.

Security remains a serious issue in many market sectors. Leica has introduced a security label for all its original accessories - prisms, tribrachs, poles and tripods and electrical equipment like batteries, cables, memory cards and even USB sticks – so users can be assured an item is genuine. The label allows customers to confirm the authenticity of an accessory at purchase, wherever they are, via the Leica Geosystems' portal "myWorld".

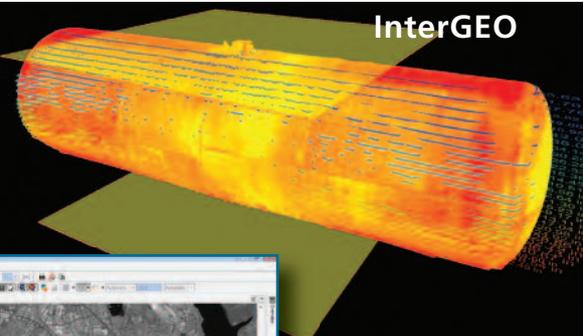
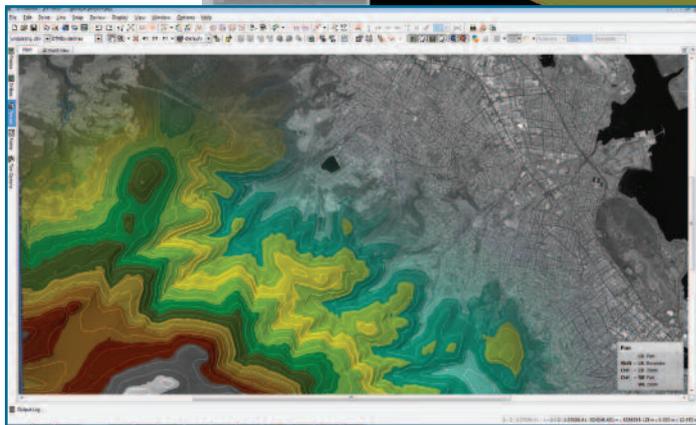
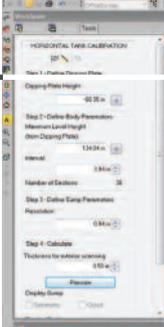
Strong software focus for Trimble

Moving on, Topcon we have mentioned but what of Trimble? The company introduced a range of new products across its portfolio, mainly focused on software, of which the announcement of a new version of its laser scanning software RealWorks version 9.0, is probably the most significant. This latest version transforms scanned data into "compelling 3D deliverables" and features revised tools and a new edition for the inspection and calibration of vertical storage tanks.

RealWorks version 9.0 supports data from virtually any laser scanner, allowing users to benefit from the powerful management, automation and analytical capabilities of the software. A new Advanced-Tank Edition reduces the time required to create inspection reports and volume filling tables from scan data. The reports can also be used in text and spreadsheet editing software for additional customization.

This version of RealWorks is claimed to enhance smart drawing tools and real-time communication with SketchUp Pro and rapidly create point cloud based models.

A new application for surveyors who collect asset data on oil and gas pipelines is Trimble Access Pipelines. The software automates common pipeline survey tasks, saving time by simplifying attribute and inventory collection and integrating all the data into one easy-to-use data collection workflow.



InterGEO

InterGEO saw major upgrades to Trimble's software including RealWorks (above) which included a Tank version and eCognition (left) which saw the launch of an Essentials version.

Meanwhile, eCognition Essentials, a basic version of their image recognition package, performs land cover mapping tasks using satellite imagery and offers an intuitive image analysis solution that allows users of all levels to quickly produce high-quality, Geographic Information System (GIS)-ready deliverables.

A new version of Trimble's mobile data analysis software, Trident version 7.0 is designed to efficiently manage, interpret and extract features from digital images and point cloud data collected via land mobile systems. Enhancements significantly reduce the time required for users to transform sensor data into relevant geospatial information used in civil engineering, transportation and GIS mapping. In these applications, Trimble Trident can be used for surface modelling, roadway sign and pole detection, lane marking detection, edge and breakline detection, road geometry and clearance measurements.

Also announced was a new version of the photogrammetric software suite, Inpho. Version 6.0 provides highly automated workflows to process thousands of airborne images with high precision. New automated and interactive tools and satellite triangulation functionality increase efficiency and improve the quality of deliverables.

Enhancements to the Trimble V10 Imaging Rover, an integrated camera system that precisely captures 360-degree digital panoramic images for visual documentation and measurement of the surrounding environment, include additional integration options and high-dynamic range (HDR) imagery that help users document site conditions and perform measurements in the office. The V10 Imaging Rover now seamlessly integrates with Trimble's R-Series GNSS receivers and TSC3 controller.

Below: the Trimble V10 Imaging Rover is an unusual development for what is essentially a total station capable of capturing 360° panoramic imagery.



• There were of course many other products new to InterGEO. You can check out some of them in our Products & Services column, page 35.



Brocky's Diary Dates

The 200th anniversary of the passing of the country's first governor, survey work to relocate the site where the flag was raised to mark Bathurst, a return to Norfolk Island and rugby league news.

Since my last column I have turned 59 and two of my daughters had their 27th and 23rd birthdays so time is rushing on. Topp Tours took us to the tulips blooming in Bowral (in the Southern Highlands), a vintage loco train trip to the town Moss Vale and an excursion around the Dural area, northwest of Sydney.

Two grand luncheons

My first visit to the oldest existing building in the Blue Mountains west of Sydney was for lunch at Woodford Academy (1833) hosted by the National Trust of Australia followed by a great illustrated presentation on the Roads to Sydney by Dr **Siobhan Lavelle** who is a councillor of the Royal Australian Historical Society.

An event I rarely miss is the Ambassador Club Rugby League Grand Final Luncheon at the Bankstown Sports Club with special guests the 1984 Canterbury side which won the competition in that year. Playing in that team and present for the lunch was the man considered to be the best player in the world, **Johnathan Thurston**, currently with the North Queensland Cowboys and 2014 joint winner of the Dally M Medal with American football NFL defector **Jarryd Hayne**. An impressive crowd of 560 was liberally sprinkled with many former legends of the game including comedian **Vince Sorrenti**.

Flag Raising Dinner

At our Cumberland Group of Surveyors meeting at Parramatta Leagues Club we were well debriefed on the proposed monument and celebrations to commemorate the 200th Anniversary of the raising of the Union Jack at the first inland town of Bathurst (about 126.5 miles west from Sydney) by Governor **Lachlan Macquarie** on 7th May 1815. Lands Department surveyor **Joel Haasdyk** detailed the investigation and research carried out to relocate the exact position of the original flagpole using old Crown plans and historic sketches followed by local architect **Henry Bialowas** who brought a scale model with him of his prize winning monument to be erected around the site. It will become the most well designed tribute placed over a toilet block!

Bicentenary of Phillip's death

As a memoriam to the passing of our first NSW Governor **Arthur Phillip** in October 1814 the Museum of Sydney staged a full day history seminar with the crème de la crème of experts regaling the full house with the most up to date data on our country's founder. The eminent presenters were **Michael Pembroke**,

Michael Flynn, Grace Karskens, Andrew Tink, Gary Sturgess, Jane Kelso and Jacqui Newling telling of Phillip's early life with reference to some spying on the French, his supervision of the First Settlement including the selection of Port Jackson to start the colony, the first Government House and even food they served to guests. The outcome was most favourable to our patriarch.

Norfolk Island for the weekend

Going to Norfolk Island from Friday to Monday is not long enough at all but Kerima-Gae and I needed to tie up some outstanding issues, her for another tour during Bounty Day on 8 June next year; me to chase some information to make a CD on my conference last July. We still managed to take a look at **Colleen McCullough's** husband **Ric Robinson's** brilliant Transport and Technology Museum, which he kindly opened early for us on the Monday morning just before our departure. His collection of antique engines, still operational, is incredible along with many displays of historic vehicles and tools employed in the early years of the Pitcairners' settlement, from whom nearly half of the islanders are descended – the famous mutineers of the *Bounty*, including Ric.

Bastardry book launch

Having a strong affinity with Rugby League football and its history I could not turn down an invitation to a book launch at the Glebe book shop where retired solicitor **Max Solling** launched his book about the unjustified axing of the Glebe Club from the First Grade Premiership in 1929 after 20 reasonable seasons in the competition, most aptly titled: "An Act of Bastardry"! The proud working class Glebe Club boasted some great stars of the game, not the least of which was **Frank "Chunky" Burge** who still holds the record for scoring eight tries in one 1920 game against another defunct team (University) in their 41 to nil win. He was also an Australian representative named in the team of the century by the NRL in 2008 on the centenary of the start of the code in Australia.

• *John Brock is a Registered Surveyor in Australia and is a stalwart of FIG and its Permanent Institution for the Art and History of Surveying.*



Ordnance Survey's annual competition to win funding to help develop ideas that make best use of the mapping agency's data as well as Land Registry's licensable data, is focusing this year on housing.

Richard Groom reports.

Can geodata help solve Britain's acute housing shortage? Last year 122,590 new homes were built, up 23% on 2012.

Image © Stocksolutions dreamstime

Can geodata help people find better places to live?

Monday 15th September saw the launch of the latest GeoVation challenge – "How can we enable people in Britain to live in better places?" As is well known, the central problem for anyone trying to buy or rent in Britain – at least in London or the southeast - is spiralling house inflation, which every day puts 'a place of your own' further and further out of reach.

Pow wow

This challenge started with the GeoVation Pow Wow, which took place in July. For a day, pow wow participants identified fifty 'raw' problems which boiled down to nine themes and seventy eight 'insights'. Of the nine themes, GeoVation has chosen to concentrate on four: affordability, availability, access and infrastructure and making the best use of assets.

Chris Parker, head of GeoVation kicked off proceedings with a summary of the GeoVation journey. This is the eighth challenge in which 'GeoVationers' use Ordnance Survey products to find solutions to some of the UK's pressing problems. Previous subject areas have included health, environment, community, transport and food.

Posting ideas

The first stage of the process is to put up ideas and gather comments. For the housing challenge this stage will close on 19th November. You can submit your ideas and comment on others on:

<https://www.geovation.org.uk/geovationchallenge/>

On December 11th, the organisers will sift

through all the ideas and select those entrepreneurs who will be invited to take part in the GeoVation Camp over a weekend in January. It's an intensive two days in which facilitators and the group help to develop the ideas, culminating in presentation of each idea to a panel and the other participants and selection of those ideas which will be offered a slice of the £101,000 funding cake. Even if you don't win, the GeoVation Camp is none-the-less a wonderful training opportunity.

Everyone agrees that there is a housing crisis but for **Finn Williams**, founder of Common Office, it could be a question of dealing with inequality as much as supply and demand. For example, there are more rooms in London than people and, although the British build the smallest houses in Europe, we don't have the smallest floor area per person. He suggests making moving cheaper, to make 'down-sizing' more attractive.

For this year's GeoVation, Ordnance Survey has partnered with the Land Registry. **Lynne Nicholson** is senior project manager there. She is looking towards the publication of registry data to promote economic growth and is in the process of preparing over thirty datasets for publication over the next few years. For her, GeoVation is an opportunity to realise the benefits from publishing the data.

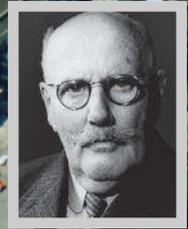
Previous GeoVationers

The launch evening rounded off with brief talks by four former winners of GeoVation funding. **Nicola Wheeler** from Green Space Mapper aims to identify and transform wasted and ill-used space by empowering local communities. **Ayo Isinkaye** is working on a project to improve the way we recycle, by realising the value in waste. **Richard Page** is developing a means for farmers to offset the production of carbon by industry. It's to do with raising the level of carbon in the soil. Apparently a 1% increase in carbon within the soil within the UK would be equivalent to removal of 100 million tonnes of carbon from the atmosphere. **Dan Raven-Ellison** has won funding from two previous challenges for Mission Explore (<http://www.missionexplore.net/>) and, through personal experience, brought right home to the audience just how critical the housing crisis is in London.

• *GW will keep readers posted on the winners and their ideas in the new year.*



The Wild-Leica story



This year Leica Geosystems marks 50 years of trading in the UK. To celebrate, the company commissioned editor **Stephen Booth** to author a history of the company in the UK. Below he presents an abridged version for **GW** readers.

Two small towns in Switzerland – Heerbrugg and Aarau – have played a major role in the evolution of measurement technology. Their two names are intertwined in the histories of Wild Heerbrugg and Kern of Aarau, two of the companies that now comprise Leica Geosystems. They can trace their origins back nearly 200 years to the founding of Kern in Aarau in 1819.

As Europe began to get back to normality after the Napoleonic wars, Jakob Kern returned to his native land after serving an apprenticeship as a mechanic in Germany. His workshop first manufactured mathematical instruments but with the arrival of the steam age and the demand for surveying instruments he moved into optics. Kern's instruments were used on the construction of the Simplon and Gotthard tunnels under the Alps as well as other major infrastructure projects during the 19th century.

Kern's business grew and prospered through two centuries, built on a reputation for the highest possible quality. Kern had always remained a family business, so much so that it was the fifth generation of the family that was eventually forced to merge with Wild Heerbrugg.

Wild and the T2

The second significant name is of course Heinrich Wild, the designer of the renowned T2 theodolite, a mainstay of surveying for 90 years and in production for over half a century with some 90,000 produced. Today, although

no longer manufactured, there are still thousands of Wild T2s in everyday use around the world. So, after a hard days surveying when you're relaxing in the evening, raise a glass to Heinrich Wild.

Like Kern, Wild too served his apprenticeship in Germany but with the Carl Zeiss company. He returned to Switzerland and the little town of Heerbrugg in 1921 to establish his business as Wild Heerbrugg. He was responsible for many significant developments to surveying and mapping instruments before leaving in 1935 to join Kern where he continued to design and improve many instruments.

Meanwhile, Wild Heerbrugg carried on growing and in the 1930s launched the world's first stereo plotter – a device that was in demand by both sides in the Second World War as photo-reconnaissance came of age and invading armies demanded maps quickly. Together with Wild's aerial and close-range terrestrial cameras, these vast opto-mechanical stereo plotters remained the mainstay of map production organisations and photogrammetric applications until the digital age made them redundant.

The UK burgeons

The immediate post war years presented many opportunities for companies like Wild Heerbrugg as Europe re-built and expanded its infrastructure. In Britain by the 1960s work was in full swing on many major projects. The M1 had been completed in 1959 and during the next decade over 600 miles were added to the motorway network. Trunk roads too were improving rapidly. Journeys that once took 8 hours shrunk in some cases to half that. Everywhere you looked Britain seemed to be busy with construction: bridges, underground railways (the Victoria Line), iron & steel works, nuclear power stations, sewerage schemes and oil platforms. In addition, new towns were established including one in Buckinghamshire that was to play a significant role in our story.

Wild Heerbrugg decided to establish a UK branch in 1964. Previously distributed in the UK by drawing office suppliers Hall Harding, Wild's world renowned instruments would

Below: HM The Queen is shown Wild instruments at the opening of Ordnance Survey's new headquarters in 1969. Right (top) Jack Simpson, Wild's first UK MD, right (bottom) his successor Brian Snelling



now be sold directly. The business began in Church Street, Maidstone Kent in August 1964 under the directorship of Major Jack ("Stiffy") Simpson, previously the company's UK representative servicing blue-chip customers like Military Survey, academia and Great Britain's mapping organisation Ordnance Survey, whose activities at that time extended way beyond our shores through the Directorate of Overseas Surveys.

Leadership honed in battle

Jack Simpson led the company for 12 years; and a leader he certainly was. Like so many senior people back then Major Simpson had been tested and not found wanting in the Second World War. He fought at Arnhem in 1944 (vividly recorded in Cornelius Ryan's film "A Bridge Too Far") and was one of only four soldiers from that battle to escape and return to England. He was awarded the Military Cross.

The choice of Kent as a base for Wild Heerbrugg UK made good business sense. The recently built M2 motorway was nearby with good links to the Channel ports for importing equipment as well as to London, then enjoying a construction boom. Within two years a sales manager was needed and Brian Snelling joined, later to succeed Jack as MD.

In May 1969 Wild Heerbrugg UK was honoured to be invited to the opening by HM The Queen of Ordnance Survey's new headquarters in Southampton. Her Majesty and the Duke of Edinburgh were shown a variety of Wild equipment by MD Jack Simpson including the newly introduced Wild DI10 Distomat, T4 Universal Theodolite and N3 precision level.

Precision technology

Before the days of lasers and total stations, in the right hands a Wild precision level and theodolite was an ideal way of maintaining accuracy. One customer in the aviation business, where everything has to be rigorously checked in line with ministry specifications and accuracies to a few thou, used three Wild N3 precision levels for re-jigging helicopter fuselages and precision aircraft components. They found the combination with a Wild T2 theodolite enabled them to "achieve otherwise impossible accuracies."

Service to the power of three

The writer once asked a surveyor what three things he looked for in a total station. His reply was, 'Service, service and service'. In construction, despite the operator's care (or lack of it!), surveying equipment does not always fare well. Instruments occasionally get dropped or even hit by moving machines. It was therefore an early priority for Wild UK to establish a repair and maintenance facility to save the expense and time of returning instruments to the factory in Switzerland. One

image from an early newsletter shows a selection of battered and dented instrument cases with their contents all requiring a health check at the Chatham service department.

Rapid technological change

The 1970s and 80s were a time of rapid technological development. Surveying instruments in 1964 still relied entirely on mechanical and optical engineering principles. But the first EDMs like the Wild DI10 Distomat, used electronics for their operation and it was a logical further step to incorporate electronics in a theodolite so the two could communicate with each other. What was missing was some way of recording the readings. The answer was the Wild GEOMEM data memory. The days of the surveyor's field book were now numbered. By the late 1970s distance measurement and data recording had all merged into the Wild Tachymat TC1, the first modern total station, incorporating angle and distance measurement and a means of recording. It was an instrument that surveyors could only have dreamed about in the first half of the 20th century.

Launched in 1977, the TC1 remained in production until 1983 when it was succeeded by the TC2000. With greater accuracy, better battery life and functionality, the TC2000 along with the TC1600 were to become a mainstay of professional surveyors and site engineers throughout the 1980s and well into the 1990s before being superseded by the Leica TPS 300/900 and Flexline series in 1998.

Significant new technologies appear

Two decades after Wild set up in the UK the world was a very different place. The office PC had arrived and there was an air of digital innovation throughout business and industry. Suddenly everyone was talking about computers and microprocessors. It was a time when computers were definitely saying "Yes".

Several significant technologies that we rely on today for measurement first emerged in the late 1980s. In 1986 the DIOR 3002 reflectorless EDM was announced. Suddenly it was possible to measure to points without visiting or touching them. A decade later and the technology was available across much of Leica's total station range. Reflectorless technology was to pave the way for several important applications including Longdin & Browning's Clear Cone mobile road surveying system and ultimately, the rapid 3D scene-capturing laser scanners of today.



Above, left: The Wild DI10 Distomat was a major step forward in distance measurement. Coupled to a T2 it was an embryonic total station.

Far right: The Wild TC1 total station finally enabled surveyors to measure angles, distances and importantly, store the results

Champagne corks popped in 1956 to mark the production of the 50,000th T2.





Above: The Wild GPS System 200, launched to much razzamatazz at Heathrow, was the company's first field survey GPS system. It was soon joined by the Wild CR233 controller.

Navigation and positioning by satellites

The next development was of even more fundamental impact; one that touches so many aspects of our daily lives today. Navigation, tracking, location, positioning, mobile phones. . . all now rely on GPS (or GNSS as it is correctly called today).

In the early 1980s Wild had been watching the emergence of the first satellite receivers for surveying. Because of the relatively few satellites in orbit and weight of the equipment, applications were restricted mainly to long distance baseline measurement – an essential for accurate mapping and linear projects. In 1984 Wild announced a partnership with US receiver developer Magnavox. The first Wild receivers were launched the following year.

Computers and electronics

Many older surveyors will recall that when they started out a computer was not an electronic device but a human being; indeed, a very important one who usually presided with much authority over log tables, Peter's tables, mechanical calculators and young surveyors who failed to book their readings clearly in the correct form.

Electronics began to impinge on the surveying world from the mid 1960s onwards through instruments like the Distomats. But it was the 1970s when people became fully aware of the potential that computers held for survey.

With the arrival of the Wild's first fully electronic total station, the TC1 in 1977 the way ahead was open to develop the transfer of measured data into a digital mapping system or to CAD. At that time it was estimated that a computer system could do design work in 8 hours that a traditional draftsman and drawing office would take 90 hours. Clearly there were big savings to be made even if the kit was horrendously expensive. Typically a drawing plotter using ink-pen technology could cost £20,000 or more.

Several pioneering survey companies were active in this field, especially for road

alignment and terrain modelling. Systems like MOSS and BIPS were early pioneers. But one system, CADACS developed by a Polish surveyor Joe Cieslewicz, was used for the planning and setting out of a certain new town in Buckinghamshire that was to play a significant part in the Wild-Leica story.

On the move again

In 1987 Wild became part of the Wild-Leitz Group, which included the world renowned Leica 35mm camera. A year later the group was joined by the venerable instrument manufacturers Kern of Aarau, whose EDMs and photogrammetric systems and theodolite based coordinate measurement system were to lead to the Leica Laser Tracker system. Several of Kern's technologies were state of the art and were regarded at the time as being the equal of Wild's. The new group's portfolio now included the Kern Mekometer, a super accurate EDM that took distance measurement to new levels of accuracy and precision and could be used for reference and calibration of existing instruments.

By the late 1980s Wild's Chatham headquarters were bursting at the seams and the hunt was on for a new base. The rapidly expanding new town of Milton Keynes in Buckinghamshire – located in the heart of England with easy links to the M1 motorway – was ideally placed to service customers. The move came in September 1989 to the Knowlhill area and into newly built award-winning premises.

Following a brief period trading as Wild-Leitz, the name of the company name settled to Leica although the Wild name continued for awhile as a brand. The company was now poised for rapid advancement across its various businesses. It was a time that would see a number of world firsts in the fields of vision, measurement and analysis. It was also time for a new man at the helm. Brian Snelling retired in 1987 and died peacefully last year. His successor, Neil Vancans was initially sales director before becoming in 1992 managing director of Leica UK Ltd.

New technologies

New technologies which appeared at this time included the Wild NA2000 bar-code reading digital level (1990) and the Disto (1993). At the time the Disto was launched Leica was nervous of the likely uptake as the cost was several times that of otherwise competing ultrasound measurers. They needn't have worried. Surveyors loved it. For the first time they had an accurate and reliable handheld EDM, even if the first models were the size of a house brick!

GPS too became more practical for day-to-day survey applications, driven by Leica's spectacular launch of their first GPS field survey receiver, the Wild GPS System 200. Hundreds of surveyors and engineers remember the dry ice and carefully scripted "New Era" roadshows



Technology was powering ahead in the 1980s. Far left: Wild's first GPS receiver the WM101 was reminiscent of a ghetto blaster! Centre: the first reflectorless EDM the DIOR 3002 and data logger. Above: The Kern Mekometer.

that marked its arrival. But what surveyors were waiting for was completion of the GPS satellite constellation which became fully operational in 1995. In 2006 GPS surveying (by now increasingly known as GNSS) took a further step forward with the launch of Leica's SmartNet service based on Ordnance Survey's network of continuously operating static receivers. The service now enabled users to survey with only one GNSS receiver. Real-time kinematic (RTK) surveying had arrived and Leica's competitors soon followed.

Meanwhile the total station had advanced rapidly, driven by competition from rival manufacturers. Following the Wild TCI, the mainstay of the 1980s and early 1990s were the TC1600 and TC2000 models which included much easier data recording and transfer to the growing number of office CAD and terrain modelling systems. These models were succeeded in 1998 by the TPS 300/1100 models which added features like reflectorless EDM, laser plummets, colour touch screens and with the launch in 2005 of the SmartStation, GPS. These developments led to the "MergeTech" technology of today, seen in the Leica MS50 Nova Multistation which includes a laser scanning option.

The rise of the machines

Another technology, or rather an application, that has come of age is machine control. Once lasers became commercially available several companies began using them to maintain line and level for construction machinery. But it has only been since the arrival of GNSS that it has been possible to introduce very fine control to machines like pavers, graders, bulldozers and excavators.

From the late 1980s static rotating lasers like the Wild LNA30 were used as a reference for machines. But with the availability of GNSS much more sophisticated machine control has become available. With the acquisition in 2006 of Scanlaser by Leica's parent Hexagon, the company was able to develop a whole range of machine control solutions. Today those solutions mainly rely on survey technologies like the Leica iCon range that underscores the company's vision of the "fully connected construction site".

An EDM on what?

Probably the most significant technology of all that was to emerge in the 1990s was laser scanning. Pioneered by a number of companies on both sides of the Atlantic, Cyra Technologies' Cyrax 2400 scanner first appeared in the UK in 1999 at the World of Surveying show at the Motorcycle Museum. At the time, one wag described it as "like an EDM on steroids!" He wasn't far wrong and Leica (by now calling themselves Leica Geosystems) were so impressed they invested in Cyra and bought the company two years later. That move heralded the development of



Two revolutionary products from the 1990s. **Above left:** the Wild NA2000 digital level. **Above right:** The Leica Disto.

a line of scanners under the HDS branding. High definition surveying had arrived and the point cloud is increasingly today the deliverable survey companies give to clients.

The future

The late 1980s and early 90s saw the rise of the multi-national global company. Although Wild Heerbrugg had many companies around the world, including in the UK, it still had something of the friendly Swiss family business it began life as in the 1920s. In 1998 Leica became part of the Investec group and by the early years of the 21st century the Wild name was no more and Leica Geosystems, now led by **Mark Concannon** and **John Fraser**, was part of the multi-national e3bn turnover Hexagon Group.

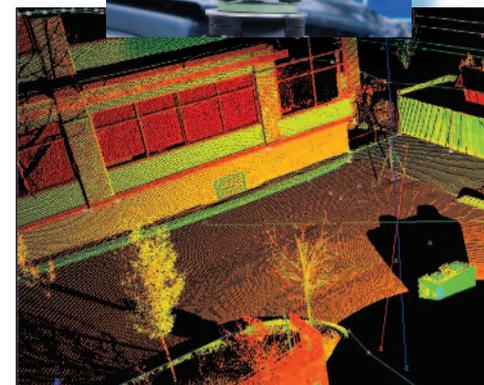
Today Leica Geosystems produces not only total stations, GNSS receivers and laser scanners but airborne systems like the ADS and ALS series of LiDARs and digital sensors, terrestrial mapping systems like Pegasus and has recently begun exploiting the potential of UAVs through the acquisition of the Swiss company Aibotix.

These measurement technologies play a part in so many industries and sectors. Agriculture, environmental monitoring, remote sensing and security can all be added to Leica's core business of supporting infrastructure development through building and civil engineering as well as playing a key role in systems like BIM, GIS and facility management.

Let us conclude by stating that predicting where measurement technologies will go over the next 50 years is beyond the crystal ball gazing of this history. But one thing is certain, Leica Geosystems or its successors will be at the forefront.

• **Leica Geosystems is marking its 50th anniversary year with various events and the publication of a book that traces the history of the company with over 350 photographs. If you are a regular customer of Leica's then you will probably receive a copy. If you don't, PV Publications has a limited stock that will be available for purchase in the new year. More details from +44 (0)1438 352617.**

Below: With the arrival of the laser scanner the point cloud has increasingly become the deliverable.





Judicial Review – a proposed change to the perception of ‘The rule of law’?

By Carl Calvert

The rule of law is fundamental to democracy everywhere. But unlike other countries Britain has no written constitution or constitutional court to settle disputes. We have to use the process of Judicial Review, which is now under threat argues **Carl Calvert.**

The reason for the subject matter – Judicial Review – is that it is part of the current Criminal Justice and Courts Bill currently (20 October 2014) in the House of Lords. In that Bill, Part 4 sets out changes both to the way that Judicial Review operates and also limits those who can invoke it. Judicial Review is one of the few ways in which government or those in public office can be held to account.

A report published on 4 July 2014 by the House of Lords constitution committee on the Bill warns that the changes may undermine access to justice and weaken the ability of citizens to challenge decisions of government or state agencies. **Lord Lang of Monkton** (chair of the committee) said: ‘Judicial review is an important means for citizens to challenge the legality of decisions by the state, so access to the process should not be unduly restrained.’

In particular, the proposals raise concerns over the tightening of the criteria for granting judicial reviews, changes to the rules on the legal costs of interveners in judicial reviews, and proposals to make it easier for cases to ‘leapfrog’ the Court of Appeal.

Central to the rule of law

The report stresses that judicial review is central to the rule of law, as it provides the primary means through which parties may challenge the lawfulness of decisions made by the government and other public bodies.

So, there are three questions. Firstly a) what is judicial review? Secondly b) why have it? and finally, c) why change it?

- a) Judicial review is the mechanism by which citizens may hold the state to account. It is a powerful and fundamental tool of our democracy. It is a directly accessible check on abuse of power, holding the executive to account and requiring it to act in accordance with the rule of law.

“There is no principle more basic to our system of law than the maintenance of rule of law itself and the constitutional protection afforded by judicial review.”

Lord Dyson, now Master of the Rolls, in *R (Cart) v Upper Tribunal* [2011] UKSC 2.

The UK has no constitutional court, unlike

France, Germany and many other countries. Judicial Review is a way of providing that function.

- b) Where a public body has acted unlawfully, the court may, *as an exercise of its discretion*, decline to grant judicial review if it is certain that the outcome would be the same were the decision to be re-taken lawfully. A central function of judicial review is to ensure that decisions are properly taken by those whose function it is to take them. As a general rule, a judicial review will not look at the substance of the underlying decision, but will simply check it has been taken lawfully. It is for the courts to ensure that decisions are taken in accordance with the law, but for the executive to take the substance of those decisions.

Lord Diplock in *Council of Civil Service Unions v Minister for the Civil Service* [1985] AC 374 gave three grounds to challenge administrative decisions:

- **Illegality**
- **Irrationality (Unreasonableness)**
- **Procedural impropriety**

The first two are often referred to as substantive grounds because they refer directly to the substance of the disputed decision. The third, procedural impropriety is a procedural ground as it is aimed at the decision-making procedure rather than the content of the decision itself. The three grounds are mere indications: the same set of facts may give rise to two or all three grounds for judicial review. So, judicial review is there to keep a check on administrative decisions which cannot be, or are with difficulty, challenged in other ways.

- c) The changes outlined in the bill are due to the Government’s view that judicial review ‘has expanded massively’. The bill proposes that courts must refuse an application for judicial review if it appears highly likely that the ‘outcome for the applicant would

“... the mechanism by which citizens may hold the state to account.”

not have been substantially different if the conduct complained of had not occurred'. The Lord's committee says this could lead to 'unlawful administrative action going unremedied'. Currently the law states that courts should refuse an application only if it is inevitable that the conduct complained of would have made no difference to the result.

The following are provided for in the Criminal Justice and Courts Bill:

- allowing cases being appealed to 'leapfrog' directly to the Supreme Court in a wider range of circumstances;
- a package of financial measures, including reforming Protective Costs Orders, Wasted Costs Orders, interveners' costs and third party funding;
- introducing changes so that claims based on defects that are highly unlikely to have affected the outcome are dealt with proportionately; and
- requiring the permission of the High Court before challenging certain planning decisions.

Concerns

There are concerns that the changes restrict the way that maladministration and withholding natural justice by those in public office and statutory bodies can be challenged 'as they will fundamentally affect the extent to which government can be held to account by citizens of all political persuasions and none. Parliament must be aware that the proposals threaten to undermine our constitution and destabilise our democracy.'ⁱⁱ In any event the proposals to change Judicial Review limit the opportunity and availability to engage with 'the rule of law.'

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“The Lord's committee says this could lead to 'unlawful administrative action going unremedied'.”

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Who wants to be a surveyor?

Left: students at a Surveying Spectacular in NSW.

GW Technical Editor **Richard Groom** presents a personal view, with contributions from others, of issues surrounding the promotion, education and training of surveyors. A particular problem he identifies for the profession is that of the part-time surveyor.

“This is reflected in the haphazard way in which many of us enter the profession.”

Thanks to technology, we are now able to survey more detail, faster and more cheaply than ever before. The surveying profession has expanded well beyond its origins in ‘Land’ to encompass ‘Geospatial’ and ‘Spatial’. If it’s physical we can measure it in 2D, 3D, 4D and more. It’s an exciting world, above and below water, made even more stimulating by our ability to model the data that we survey, to analyse and display its attributes, bring it to life (through visualisation), show how objects change and most importantly, compute the hard figures needed to optimise designs.

It’s a world which should enthuse young people and have them clamouring to join in, but sadly this is not the case. Universities cannot attract the best students and employers complain that there are not enough potential employees of the right calibre in the market place.

We can think of education and training as taking place on three levels:

- **Education of the general public**
- **Education and training of technicians**
- **Education of professionals**

Educating the public

This article concentrates on promotion of the industry to the general public. This is high level education for people who should know enough about our industry to decide whether they want to join it and if they don’t, who we are and what we do.

A higher general awareness of geomatics as a profession would trickle down to more and more suitable candidates for technician and professional education and training, and consequently, better recognition for those who are qualified to practise. In Britain one has to admit that, for various reasons, including the fragmented nature of our profession, there has been very little effort in this regard. This is reflected in the haphazard way in which many of us enter the profession.

Technical education and training

At technician level, the lack of government-sponsored courses has resulted in The Survey Association setting up the Survey School in Worcester and recently in taking over ownership. The school meets the needs of the surveying companies and its qualifications are recognised by the industry.

The surveying and mapping industry has expanded beyond belief over the past thirty years. On the mapping side, CAD and GIS have provided the impetus. On the surveying side, it has been new, better and faster data collection,

processing and presentation tools. In general this is accompanied by easier operation, although one could argue that a Wild T2 was easier to operate than a high end total station.

Perhaps GIS demonstrates most clearly what has happened. It used to be the preserve of a few highly paid specialists who understood the theory and were able to work large, slow and temperamental programs. GIS is now used by millions to carry out simple queries but only a few understand it thoroughly and are able to provide advice for design and implementation of systems. In other words, there are a great many GIS users with skills gained through training and very few GIS professionals.

We live in a push-button world, but surveyors bring to that world qualities that make the best of the amazing technology that is available. As **John Hallett-Jones** of Glanville Geomatics says: “There is one aspect (of technical training) that is never talked about and that is the value of experience and the ability to have an ‘eye for the ground’, to take reality and to best represent that in the most efficient communicative way. We find that this aspect takes a good deal of nurturing with new employees and is a priceless attribute to have, but is often overlooked.”

Part-time surveyors

Does current geomatics education and training reflect this new reality? It does, in the sense that the opportunities for appropriate education and training are there. But whether surveyors actually follow them is another matter and that is largely down to perceptions of our profession by others and indeed by our own perceptions. In Britain, many people carry out surveying work and most of them probably do not have surveying qualifications. Indeed, for many, I suspect they (or their bosses) believe that there is little more needed than to buy the kit and follow the quick-start manual. There is no doubt that field surveying has been ‘de-skilled’ over the years, but every survey should follow principles that will assure its quality. The public at large (and fellow professionals who should know better) can see the field equipment in operation and it looks easy, but they do not see the planning that goes on before the survey, or the data processing and analysis that follows in the office, and these are still very much skilled activities.

These part-time surveyors are usually technicians or professionals from other disciplines carrying out surveying at a technical level. They use surveying tools for particular

purposes and see no need for training beyond, by analogy, the expertise they would need to use MS Word to write a report. Many do not see a need to learn the basic principles of surveying – and possibly don't even recognise that there are any.

From a client's point of view, what constitutes adequate education and training for this group of technicians? If they come from a civil engineering background they probably receive some surveying education and training as part of their civil engineering course, but is it fit for purpose? Would surveyors consider that the lecturers are competent to convey 'the surveying body of knowledge' to their students? Anecdotal evidence suggests that this question needs addressing. If the surveying module in non-surveying courses is taught to a shallow level by poorly qualified lecturers focusing primarily on the array of technology available, the students will see 'specialist' surveyors as experts in the trivial, which is wholly damaging to us.

When part time surveyors enter the world of work, or are called-upon to do 'some survey work', how do they learn to select and use the right equipment for the job, process, report and manage the results? Surveyors (or rather, their clients) should be crying out for modular structured training, with associated education, that includes meaningful certification of courses (and certification for graduates), and those modules should build towards a chartered qualification. Also, clients should value certification: the benefit of being able to recognise 'good', as an assurance of competent work. As **Graham Mills** of Technics says "Certification through a recognised body would help to raise the bar."

The surveying consultant

Unfortunately, part time surveyors also tend to act as the client's agent, when commissioning larger projects. When working in an advisory and supervisory capacity they should, at least, be intelligent clients, which arguably means that they are working in the third of the categories listed at the beginning of this article. They are doing consultancy work, potentially demanding a much deeper understanding of geomatics, which they seldom possess or, just as importantly, sufficient understanding to know the bounds of their knowledge and when they need to hire a consultant. In large organisations, this is work that should be carried out, or at least overseen, by qualified professional surveyors.

But local and national government departments, consulting engineering and architectural practices, almost without exception, do not employ a single professional surveyor in this capacity and neither do they employ external consultant surveyors to advise. Surveying, they appear to believe, is a technician's job which can be managed by the people who will use the data. Some are

competent, but many are not. The less competent, when faced with a tender evaluation will make their judgement based upon ignorance, or the parts of the tender that they do understand – like Health and Safety – with the result that they promote the 'race to the bottom' by failing to weed out technically inadequate submissions and failing to accept the best value bid that meets the requirements of the job. When it all goes wrong, you can bet that it will be the contractor's, or the profession's fault. Perhaps surveyor licensing is the answer, but surely we can achieve a better result through adequate education, training and regulation.

Most surveying work is required to support projects and another frequent hindrance to good surveying is the current passion for 'project management': an activity which is the preserve of generalists who, as **Chris Preston**, RICS Geomatics Professional Group Chair, says, "know a little about a lot of things but not too much about anything! Unfortunately, that 'anything' usually does not include surveying, geomatics or associated fields. It is purely about delivering a project to budget, on time and hopefully what was needed. Geospatial engineering is now considered very specialised and those who do the actual data collecting, lowly skilled."

The challenge for surveyors is to express the value of their work, because this frequently manifests as 'savings' or as risk mitigation, to which the client could well be blind or sceptical, whereas he can see the costs without any help. Also, those benefits and savings arise over the lifetime of assets rather than of projects, which is therefore beyond the deliberately blinkered view of the project manager. BIM looks at lifecycle asset management, so it should help to overcome the short-term mentality, but it is still more likely that individual phases of the BIM lifecycle will be managed as individual projects and that the long-term benefits of survey will be overlooked.

Are we powerless?

We appear powerless to break this prejudice. However, there are a very few organisations that do employ professional surveyors to oversee their geospatial activities. Their role is to advise within the organisation, ensure that surveying is fit for purpose and provides value for money, maintain the surveying infrastructure and manage and archive surveying data. The success that they achieve is largely down to just 'being there' and therefore being in a position to influence, even if only at the lower levels of the organisation. They have to cultivate champions to survive, usually with no support from the profession and yet their presence is crucial to the health of the industry as a whole.

Promoting the profession

So, what are we doing to promote our



Students on a Surveying Spectacular get to use modern instruments under enthusiastic instruction.

"... surveyors bring to that world qualities that make the best of the amazing technology that is available."

profession in Britain? Ten years ago, Newcastle University established a website – www.geomatics.org.uk which was excellent for its time and well received, but it relied upon support from industry bodies as well as a hefty grant and is now no longer operating. The professional institutions have websites which give descriptions of the profession. The RICS has recently taken substantial adverts in *The Guardian*, but one has to question whether the audience of prospective geomatics surveyors reads that paper.

There are occasional TV programmes that feature surveying in some form or other. For example, surveying has played a bit-part in Time Team, there was a fascinating programme featuring survey control surveying in the Andes a few years ago, and more recently the use of LiDAR was used to uncover the mysteries of Angkor, in Cambodia. The latter did not mention surveying or geomatics – just the technology, thus reinforcing the unhelpful notion that the tools are paramount. Of more relevance to 8-15 year olds is Minecraft. It introduces the concepts of mapping and to some degree design and engineering through the gaming environment. Perhaps there is a way to use this to help promote our profession. To read more about this link see the August issue of our sister title *GIS Professional*.

In Britain there is a recent initiative to promote construction in schools. Class of Your Own (COYO) is a British charity aiming to dispel the negative image of construction as a career path. Surveying is included within the scope of COYO but therein lies another problem: the perception that surveying is just a service to engineering and construction. Whilst COYO is a commendable idea, it does nothing to tackle the surveyors' identity crisis and promote the distinctive qualities that surveyors offer. Stemnet (Science Technology Engineering and Mathematics Network www.stemnet.org.uk) is an organisation with a similar role to COYO but with a more general remit. A unique aspect of its strategy is STEM Ambassadors. There are 27,000 volunteer ambassadors who act as role models and promote STEM subjects to young learners. Stemnet also has a STEM Clubs Programme, which provides free, impartial, expert advice and support to schools that want to set up or develop a STEM Club. The clubs are a fun and rewarding way to boost enjoyment and learning across STEM, outside the classroom.

The geomatics skills shortage is not just a problem in Britain. A European project – GeoSkills (<http://www.geoskillsplus.eu/>) aims to identify and set up optimal ways to Raise Awareness of GEO studies and increase student enrolment in the EU. The Netherlands is also having difficulty attracting young people into surveying. That country's solution was to club together to produce a very impressive video: <http://geo-pickmeup.com/>

[why-we-need-geographers-the-go-geo-campaign/](#)

Surveying spectaculars

Several years ago, in New South Wales, Australia the problem was approached from several angles, as described by Roberts and Iredale in *GW* Jan/Feb 2011. They reported that work experience placements can be useful, provided that the company offering the placement is whole-hearted about it, otherwise it can be a destructive experience not just for the student but also for the industry – bad news travels even more rapidly than good news. In Britain, work experience placements are offered to children at age 15/16 and generally too often arranged by the student's parents. Three organisations in New South Wales clubbed together to produce a successful DVD. They also arranged 'Surveying Spectaculars' otherwise known as 'Maths in Surveying Days' in schools and formed links with the state-wide association of careers advisors – perhaps the most valuable means of connecting limited surveying resources with the maximum number of students. They have also worked with the NSW department of education to put surveying examples in the mathematics curriculum and with the author of a textbook with the same objective in mind. Frequently school students see topics like geometry as completely irrelevant, yet geometry is pivotal to geomatics and some surveying involvement could be highly motivational.

Identify the problem

In the course of writing this article it has become clear to the writer that we should target our efforts in two directions, firstly towards the public at large, particularly at school age and secondly towards the professional advisors from other disciplines who hold such sway over our industry and can cause it such damage.

Co-operation is the key

A feature of the Australian experience is that they could only muster the resources needed through the co-operation of several professional bodies. When it comes to high level promotion of the industry, that co-operation could extend across all the geospatial disciplines, including GIS and cartography through, for example, UK GeoForum or the kind of co-operation that resulted in GeoBusiness. Funding should come from the institutions, which means pushing the subject higher up the agenda and perhaps that could be supplemented by crowd funding contributions for a specific project?

Acknowledgements:

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“Frequently school students see topics like geometry as completely irrelevant...”

SphereVision Video Mapping Software



Arithmetica has released a suite of software solutions designed to complement its 360° video capture systems and services. vMap360 and RouteView360 video mapping software allow for the registration of 360° video imagery to floor plans, maps, aerial photography and online mapping systems like Google Maps, allowing users to explore remote locations from the comfort of their desktop.

Leica RCD30 – better resolution

Leica Geosystems' RCD30 Penta Oblique system is now available with new optics. The camera is now available with 80 mm and 150 mm focal length respectively. In combination with the new 80 Mpx CCD sensor, the RCD30 provides data with even more detail. These features make the RCD30 the only oblique system able of acquiring 4-channel RGBN multispectral data with 10 centimetre Ground Sampling Distance (GSD) from an altitude of 3,000 metres.

ZEB1 for tree surveys

The ZEB1 handheld laser scanner is helping researchers in New Zealand develop new working practices to characterise forest stands for management and research purposes. The team at Scion, a NZ Crown Research Institute (CRI), required a practical means for accurately locating and measuring individual trees on the ground. Using the ZEB1 they achieved significant advantages in speed of data capture, quality of the resulting point cloud and ease of use of the system. Scion purchased the ZEB1 from 3D Laser Mapping, following successful trials of the

technology. The project team aims to extract tree diameters, locations and stem shapes from the point clouds.

LiDAR from Leica

Leica Geosystems has introduced its next generation of airborne LiDAR solutions, the Leica ALS80. By incorporating advanced laser technology, new high-speed point cloud generation, faster acquisition and processing time are now possible. Users benefit from the new Leica ALS80-CM and ALS80-HP systems' expanded Multiple Pulse in Air (MPIA) capabilities and a new scanning geometry that offers pulse rates of up to 1.0 MHz. This technology greatly expands pulse rate capability throughout the entire range of flying heights, allowing faster collection rates and shorter flight times. For users operating in mountainous terrain, the ALS80-HA offers significantly increased pulse rates during high-altitude operation.

Pointfuse standalone

Pointfuse, an automated point cloud processing software, has been released as standalone software, offering a fast, precise, yet flexible way of converting laser scanner point clouds into

highly accurate vector models. It was previously only available as Software as a Service (SaaS). In addition to the paid version of Pointfuse, a free viewer and iOS APP will also be available that allows point cloud data to be converted to a vector model that can be visualised as 3D or 2D.

Pointfuse is fully mobile compatible, and can process data from mobile scanners as easily and quickly as from terrestrial or airborne systems and its results can be output and used on standard handheld mobile devices for use in the field. The software also offers automatic feature extraction, automatically identifying features such as power-lines, bridges, gantries and crash barriers within the point cloud and extracting them within a matter of minutes.

Civil engineering contractor Skanska has found Pointfuse software greatly speeds up the creation of line drawings for highways schemes thanks to automated point cloud processing. The company has successfully trialled automated extraction of features from a mobile mapping system on a stretch of motorway. Pointfuse was used to process the large point cloud, recognising and extracting features automatically in a matter of minutes.

Building modelling

The automatic creation of GIS-ready 3D city models and textured buildings from aerial images or LiDAR is rapidly gaining importance as national mapping agencies and municipalities are seeking to convert their cadastre or base map from 2D to 3D to support better planning, taxation, civic engagement and the growing number of smart city applications. Unfortunately, the majority of the world's countries lack accurate land information or existing building footprints. This combined with rapid urban change and regionally unique architecture styles have made the automated extraction of buildings from airborne images with similar accuracy and recognition rate a real challenge. Leica's tridicon Building Finder solves this and

the company's customers are now able to automatically create highly accurate 3D City Models from airborne images without any prior knowledge. Results can be further improved when combined with the Leica RCD30 oblique camera system.

Geodetic receiver

Topcon has announced the next generation of its geodetic GNSS reference receivers and antennas: the NET-G5 receiver and CR-G5-C antenna. Using Vanguard and Universal Tracking technologies, the NET-G5 receiver incorporates 452 channels capable of tracking the full GNSS signal spectrum, including modernized GPS, GLONASS, Galileo, Beidou, QZSS and SBAS signals. Universal Tracking has the advantage and capability to assign any visible GNSS signal to any available receiver channel.

The CR-G5-C is a full-wave geodetic choke-ring antenna designed to address evolving requirements for reference networks and infrastructure monitoring applications. The CR-G5 antenna has excellent vertical phase centre stability over the entire GNSS frequency band, providing superior performance in tracking low elevation satellite signals. It also employs cavity filter technology to more aggressively combat radio frequency interference in difficult environments.

GNSS/INS for UAVs

Applanix has announced the APX-15 UAV GNSS-Inertial system for small UAVs by reducing - or even eliminating - ground control points. Sidelap is also significantly reduced, increasing the area flown per mission. APX-15 UAV includes POSpac UAV post-mission software to produce highly accurate position and orientation for direct georeferencing of cameras, LIDARs and other UAS sensors. The APX-15 UAV, measuring just 6cm x 6.7cm and weighing only 60 grams, features a high-performance, survey-grade, multi-frequency GNSS receiver and state-of-the-art low-noise MEMS inertial sensors, all on a single board.

Optech releases LMS 3.0

Optech has announced the release of Optech LMS 3.0, a lidar mapping suite for airborne and mobile workflows. The suite represents a major advancement for users of Optech ALTM, Lynx and digital imaging product lines for high-precision surveying applications.

Hyperspectral for UAV

Leica Geosystems, Aibotix and Headwall Photonics have announced an integrated high performance airborne sensor utilising a hyperspectral imager and the Aibot X6 UAV. The Nano-Hyperspec sensor has been optimized in terms of size, weight, and power to enable the aerial acquisition of all spectral and spatial data within the scene of interest. Precision agriculture, forestry, geological research, and environmental monitoring are typical application areas that could benefit from this system. The sensor measures only 76.2mm x 76.2mm x 119.4mm and weighs less than 0.68kg. Integrated data storage is 480Gb and will yield more than two hours at a frame-rate collection rate of about 100fps, matched to the actual performance of the UAV itself.

New LiDAR sensor

Optech has announced the ALTM Galaxy with PulseTRAK technology enabling a continuous operating envelope that solves the challenge of coverage gaps and density variation in the multi-pulse transition/blind zones; up to 8 returns per emitted pulse, which eliminates the storage and processing burden previously required for increased vertical density.

Handheld's NAUTIZ X8

Handheld Group has announced the NAUTIZ X8 rugged PDA, a handheld computer built for tough field conditions primarily in GIS, land surveying, public safety, forestry and military applications. It has an IP67 ingress protection rating and meets stringent MIL-STD-810G military test standards.

The device has a Texas Instruments 4470 dual-core 1.5

GHz processor, 1Gb of RAM, 4Gb of iNAND Flash and a 5200 mAh Li-ion battery that lasts up to 12 hours on a single charge. The Nautiz X8 has a large 4.7" ultra-bright capacitive multi-touch screen with chemically strengthened Asahi Dragontrail glass. The unit weighs 490 grams.

Leica Cyclone 9.0

Significantly faster and easier scan registration, plus better 2D and 3D drafting tools and steel modelling are features of Leica Cyclone 9.0, which include major, patent-pending innovations. Cyclone 9.0 allows users to scale for larger, more complex projects while ensuring high quality deliverables consistently.

Cyclone 9.0 automatically processes scans and, if available, digital images to create groups of overlapping scans that are initially aligned to each other. Once scan alignment is complete, algorithmic registration is applied for final registration. This new workflow option can also be used in conjunction with target registration methods.

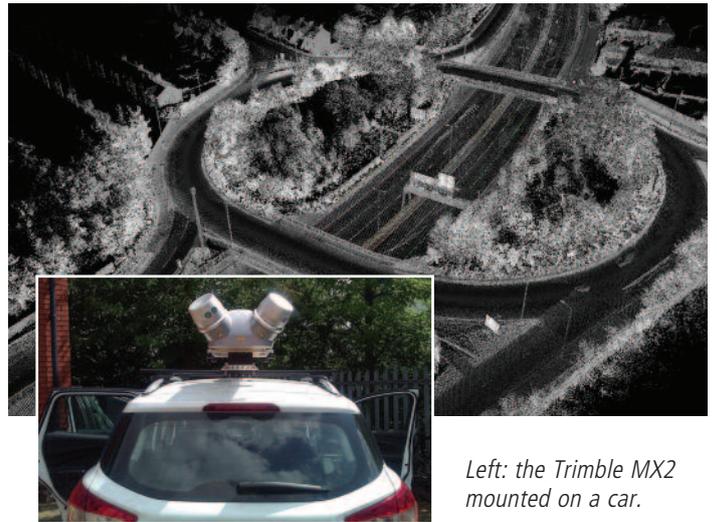
Seismic monitoring

Trimble has introduced an integrated GNSS reference receiver, broadband seismic recorder and a force-balance triaxial accelerometer for infrastructure and precise scientific applications. The Trimble SG160-09 SeismoGeodetic system provides real-time GNSS positioning and seismic data for earthquake early warning and volcano monitoring as well as infrastructure monitoring for buildings, bridges, dams and other natural and manmade structures.

High end robotic and geodetic receiver

Sokkia has announced the release of the latest addition to its line of high-accuracy measuring total stations, the NET AXII. Designed for precision-intensive tasks such as monitoring, bridge construction, and other highly detailed engineering projects. The series includes the NET1 AXII and the NET05 AXII with 1" angle accuracy and 0.5" angle

Mobile spatial imaging



Left: the Trimble MX2 mounted on a car.

UK Trimble supplier KOREC has introduced latest addition to its mobile spatial imaging portfolio. The Trimble MX2 is an easy-to-use vehicle-mounted spatial imaging system, which combines high-resolution laser scanning and precise positioning to collect geo-referenced point clouds and 360° images for multiple applications. The system is available with one or two laser heads with the dual-head system using a 'butterfly' LiDAR configuration to minimise shadowing. Both variants come with the option of a 360° camera. Survey results are processed with the included Trimble Trident software to swiftly extract and analyse the raw data to turn it into useful geospatial intelligence.

accuracy, respectively.

Sokkia has also announced a GNSS reference receiver, the GNR5, which utilizes 452 channels and is optimized to track the full GNSS spectrum. The GNR5 is designed to assign any visible signal to any available receiver channel and is capable of tracking the GPS, GLONASS, Galileo, Beidou, QZSS and SBAS constellations.

Topcon UAV with RTK

Topcon and MAVinci GmbH have announced the latest version of the Sirius Pro surveying UAV, designed to be compatible with existing RTK base stations or NTRIP (network transport of RTCM data over IP). By connecting an external base station, Sirius Pro will receive the RTCM correction signals and deliver 2-5 centimetre accuracy without using ground control points.

Data Marketplace for InSphere

Trimble has announced a new

Data Marketplace service for its InSphere geospatial information management platform, which allows geospatial professionals to quickly search, locate and obtain spatial data on demand. InSphere users can now find and use additional free and premium spatial data layers, including aerial and satellite imagery, terrain, elevation and topographic maps, building footprints and other third-party data. In addition, new capabilities have been added to a variety of InSphere applications to streamline geospatial data access.

Routescene mobile mapping solution

Routescene has launched LidarPod, a new turnkey 3D mobile mapping solution that uses Velodyne LiDAR technology to provide rapid 3D data collection and automated processing. It is simple to operate and enables rapid deployment in the field and has been developed specifically for use on UAVs but

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