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The USA's National Spatial Data Infrastructure Needs Improvement

GIM International Interviews COGO Chair Michael Vanhook



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UASs for Thermal Mapping

Mapping Road and Bridge Damage in the Czech Republic



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Benefits of Sweeping Airborne Cameras

A3 Edge Camera Captures Saint Petersburg and Boreal Forests



On the cover of this month's edition of *GIM International*: Global Vision's young and dynamic UAV survey team in action, mapping an open-cast mine in South Africa with the latest survey technology. On page 30-31 you can read more about Global Vision in the Company's View feature.

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GIM International, the global magazine for geomatics, is published each month by Geomares Publishing. The magazine and related e-newsletter provide topical overviews and accurately presents the latest news in geomatics, all around the world. *GIM International* is orientated towards a professional and managerial readership, those leading decision making, and has a worldwide circulation.

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Staying in the know

I'm happy and proud to announce the first ever GIM International Summit, scheduled for 10, 11 and 12 February 2016. Amsterdam will provide the backdrop for the inaugural event, and the unique venue in the old part of the city will be buzzing with geomatics professionals for two and a half days. The GIM International Summit will be focused on discussing the future of the field of geoinformation – for educational institutes, industry and policymakers alike. The summit will be very much based on the concept of 'inside looking out' rather than merely insiders' perspectives. The main topics of the summit will be Water, Food Security and Social Justice, all under the overarching theme of 'Seeking Space for Future Development', thus helping to prepare decision-makers for a sustainable future. Endorsing partners of the GIM International Summit are Kadaster International and ITC, University of Twente. Needless to say, the GIM International Summit will offer you ample opportunities to network with your peers, both during the conference itself and at social events throughout the beautiful city of Amsterdam. The event will be future-oriented,

forward-looking, explorative and sometimes even provocative.

Discussion at the GIM International Summit will be fuelled by speakers from outside the traditional geomatics world, all of whom are experts in their own field. They will explain the needs and desires of the wider world and how they would like to see the geomatics sector develop. We can reveal a few of the names already. One is Morten Jerven, associate professor at Simon Fraser University, Vancouver, Canada, who is widely published on African economic development, particularly on patterns of economic growth and economic development statistics. Another speaker will be Geert Bouckaert, professor at the Faculty of Social Sciences at the Catholic University of Leuven, Belgium, director of the Public Governance Institute and president of the International Institute of Administrative Sciences (IIAS). Bouckaert's research focuses on implementation of the policy and management cycle in local governance, and on administrative and judicial trust, and he knows how to apply those topics in a geoinformation context. And thirdly Ole Stilling from Denmark, chief executive officer of the International Federation of Housing and Planning, will address the conference on the development and implementation of concepts for integration of sustainable development in regional and urban development projects with help of high-quality geoinformation. Watch this space since more names will be announced shortly.

Enclosed with this month's issue of *GIM International* is the *GIM International* UAS Special Edition 2015. We pay considerable editorial attention to unmanned aerial systems (UASs), in terms of both technology and legislation, in many of our regular issues but this Special Edition is a compendium of articles on the latest developments and applications. Keep it on your desk – it will no doubt come in handy on many different occasions. I really do hope that, with this special supplement on UASs and with the upcoming GIM International Summit 2016, we will continue to fulfil your need to stay up to date and in the know.



▲ Durk Haarsma, publishing director

Photography: Arie Bruijsma

EAB

The Editorial Advisory Board (EAB) of *GIM International* consists of professionals who, each in their discipline and with an independent view, assist the editorial board by making recommendations on potential authors and specific topics. The EAB is served on a non-committal basis for two years.

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Closing the Cadastral Divide

The 'cadastral divide' is a term used for describing the gap between countries that have efficient and effective land administration systems in place and those that do not. On a global scale, the distribution is currently about 30% who do and 70% who do not. Attempts have been made over many decades to establish cadastral systems in less-developed countries, but with little success. Constraints relate to a range of legal, institutional and political issues – but also to the fact that implementation of traditional Western-style cadastral systems is simply too costly, too time-consuming and too capacity-demanding. It is estimated that, by current rates and methods, it will take many decades and probably even centuries to get anywhere near full, global coverage.

Over recent years, however, a new 'fit-for-purpose' approach has emerged in response to closing the cadastral divide. The building of land administration systems in less-developed countries is now seen merely as a staged process, initially focusing on meeting the core purposes such as providing security of tenure for all and enabling control of all land use and

natural resources. This can be achieved using aerial/satellite imageries and local participatory adjudication, while demarcation and accurate surveys of boundaries should be seen merely as an upgrading activity that can be undertaken at a later stage in response to social and legal needs and emerging economic resources.

To support this simple spatial framework there is a need to build a legal framework that will allow for implementing the concept of 'continuum of land rights' as developed by the Global Land Tool Network (GLTN) and approved by the UN. Furthermore, an institutional framework needs to be established for applying good governance and easy access to land information for all. This whole process needs to be embedded in a capacity-development strategy that is established up front to ensure ongoing maintenance and service deliveries over time. This approach was launched last year in a joint FIG/WB declaration (FIG Publication No. 60) and will be outlined in more detail in a guide that GLTN is currently preparing.

However, this change in approach will not be easy. As well as developing the capacity at country level, a key demand relates to establishing the budgetary base, e.g. through development aid from donors such as the World Bank. And, most importantly, there is a fundamental requirement for strong political will and leadership at national level. The good news is that recent experiences show it is possible – Rwanda, for example, has taken the lead and covered the whole country using a fit-for-purpose approach within 5 years and at a cost of less than USD10 per parcel.

The fit-for-purpose approach is flexible, participatory and inclusive. It is fundamentally a human rights approach in support of the new Post-2015 Global Agenda which will come into force before the end of this year. Closing the cadastral divide is now within reach – let's work together to achieve this in our time.



Stig Enemark

Most shared during the last month from www.gim-international.com



1. Lidar's Next Geospatial Frontier - <http://bit.ly/1aRTGUi>
2. Celebration of Maps during International Map Year - <http://bit.ly/1aRTtR9>
3. Confronting the Geomatics Professional's Identity Crisis - <http://bit.ly/1aRTMeT>
4. CycloMedia Launches Street Smart Application for ArcGIS - <http://bit.ly/1EtBIE6>
5. Serious Gaming Meets City Planning - <http://bit.ly/1Cl5M3u>

55th Photogrammetric Week in Stuttgart

In 1909 the renowned Photogrammetric Week was initiated by Carl Pulfrich as a 'Vacation Course in Photogrammetry'; since 1973 it has been held at the University of Stuttgart, Germany. Nowadays, the Photogrammetric Week Series enjoys international recognition as an upgrading seminar and a platform for the exchange of knowledge and experience. It has consistently attracted more than 500 participants from more than 50 countries. This year's event will be held from 7-11 September.

► <http://bit.ly/1EtAoAU>

From Laser Scans to 3D Models with New FARO Software

The newly designed PointSense for Revit software from FARO introduces new functionalities for significantly improving evaluation and conversion of point cloud data to Building Information



Revit model with point cloud.

Models (BIMs). Laser scanning is the most efficient method for capturing existing field conditions for buildings. PointSense for Revit aims to accelerate and simplify the analysis and design of this data directly in Autodesk Revit.

► <http://bit.ly/1EtAAjN>

Sentinel-1A Celebrates First Anniversary in Orbit

Having orbited Earth more than 5,300 times while providing radar vision for Europe's Copernicus programme, the Sentinel-1A satellite has completed a successful first year. The satellite carries an advanced radar to provide an all-weather, day-and-night supply of images of Earth's surface.

► <http://bit.ly/1EtzUu0>



Sentinel-1.

LAStools Toolbox for ERDAS Imagine 2014 Released

The latest release of LAStools from rapidlasso GmbH contains a new toolbox for ERDAS Imagine 2014, allowing the users of Hexagon Geospatial's remote sensing software to utilise the rapidlasso Lidar processing modules. The tools have been fully integrated into the software so that they are also available as operators within the IMAGINE Spatial Modeler framework.

► <http://bit.ly/1EtAdFT>

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ComNav and CGEOS Build First BeiDou CORS Station in Europe



Experiencing the QIAO CORS Station.

Recently, the European first BeiDou CORS station – QIAO CORS Station – was built in Wallonia, Belgium, by the ComNav local partner CGEOS. 'Qiao' means 'bridge' in Chinese and Joël Van Cranenbroeck, managing director of CGEOS, is working to build a bridge between the Chinese and European GNSS industries by introducing the high-precision GNSS technologies of Chinese company ComNav to European users.

► <http://bit.ly/1EtDPb4>

CycloMedia Launches Street Smart Application for ArcGIS



Cyclorama 360-degree panoramic image. (Courtesy: CycloMedia)

CycloMedia Technology and Esri have expanded their business relationship to deliver high-definition street-view imagery via ArcGIS Marketplace. In efforts to leverage each other's expertise in the government, transportation and utilities markets, CycloMedia developed the Street Smart web application. Users of CycloMedia's HD street-level imagery can now utilise an ArcGIS-compatible application for viewing and analysis and can visualise and edit their data from a street-view perspective, thus enhancing their GIS database while reducing field-based collection practices.

► <http://bit.ly/1EtBIE6>

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Trimble GNSS OEM

InTech.trimble.com

Dielmo Provides Geospatial Back Office for UAV Data Acquisition

Dielmo 3D is offering its geospatial back-office services to UAV, helicopter, fixed-wing and mobile data acquisition companies. For geospatial data acquisition companies that may be new to Lidar and orthophoto mapping or may have a need for increased data production capacity, Dielmo offers complete Lidar and orthophoto production services, thus negating the need to invest in additional expert personnel, software licences and employee training before being able to produce industry-leading geospatial products.

► <http://bit.ly/1EtDXy7>

Phase One Launches Small 80MP Medium-format Aerial Camera

Phase One Industrial, a manufacturer and provider of medium-format aerial digital photography equipment and software solutions, has announced the Phase One iXU 180 camera, a small 80MP medium-format aerial camera. The Phase One iXU 180 features an 80MP CCD sensor for 10,328-pixel cross-track coverage, and is so small that its body is barely wider than its lens barrel.

► <http://bit.ly/1EtAZ5N>



Phase One iXU 180 camera.

Topcon Acquires Precision Agriculture Specialist Digi-Star

Topcon Positioning Group has acquired Digi-Star, a leading company in agricultural solutions involving weight sensors and control systems for feeding, planting, fertiliser and harvest-equipment manufacturers. After several years of working together on development projects, Topcon sees Digi-Star and Topcon Precision Agriculture as a perfect fit, bringing complementary technologies and distribution channels to its rapidly growing precision agricultural division, said Ray O'Connor, president and CEO of Topcon.

► <http://bit.ly/1EtCOzl>



Topcon Precision Agriculture office.

2015 CHC Dealer Conference Held in Shanghai

CHC held an international dealer conference in Shanghai from 9-11 March, gathering together dealers from around 40 countries throughout the world. Focusing on CHC's competitiveness in the global market, George Zhao, CEO of CHC, gave a presentation about the technical breakthroughs that the company has made in the past year and mapped out the long-term strategy.

► <http://bit.ly/1EtHcPc>



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The Global Professional



Professional governance aims to provide cohesive, meaningful and recognised rules of conduct for practitioners to facilitate the provision of professional services to the citizen and business within an indemnified framework of good practice and compliance. While it is often assumed that professional governance is solely about ensuring statutory professional compliance, this oversimplifies and underestimates the true breadth of tangible and intangible benefits of professional regulation. The approaches taken to establish and ensure such professionalism can indeed range from local through national to international, and in the degree of formality from legally binding regulation to 'voluntary' professional guidance and standards compliance. All require relevancy, currency and adequate resourcing to be effective.

But what defines a professional? The Royal Institution of Chartered Surveyors (RICS) is a globally recognised professional body which regulates its members by monitoring and supporting them in their compliance with professional and technical rules, regulations and ethical standards. It defines a professional as someone who has completed formal education and training (which contains the specific knowledge and competencies necessary to perform the role of that particular profession) to a recognised and accredited standard. It stipulates that those professionals are subject to strict codes of conduct including stringent ethical and moral obligations, and that they are required

to continue their professional development throughout their careers. This balance is critical. A true professional must possess cutting-edge technical competencies which are firmly embedded within a skillset of 'professional' attributes. These are often referred to as 'soft skills', which very much undersells their significance!

As early professionals begin to build on formal academic qualifications, the requirement to be aware of and compliant with professional and statutory regulatory standards becomes critical. For many professionals across geo-related disciplines, the recognition and transferability of their skills is the passport to a global job market. For these 'global geoprofessionals' working within trans-border technical, procedural and legislative frameworks, new challenges and professional risks are presenting themselves. Indeed, irrespective of whether they are a graduate or a seasoned practitioner, in terms of the availability of clear technical guidance documentation, access to case studies of good practices and the necessary tools to continue to learn what is current in their chosen sector, the supportive structures of good professional mentoring and governance cannot be ignored.

It is imperative that professional bodies across the globe develop both technical and professional standards of excellence and integrity in the absence of and to complement existing statutory frameworks. The Society of Chartered Surveyors Ireland (SCSI) is the RICS representative body in Ireland. The SCSI's Geomatics Professional Group (PG) wishes to fill such a void through its current programme of work which is aimed at producing a range of new geo-related guidance notes and practice standards. In many instances it has been possible to revise/adapt heretofore (primarily) UK-focused RICS regulatory guidance and standards. The RICS Land Group has supported and facilitated the SCSI PG in the 'transformation' of these Practice Notes and Guidance documents to reflect and 'fit' the Irish profession and market. A diverse range of geo-related topics has now been published (such as the Use of GNSS in

Surveying and Mapping; Surveys of Land, Buildings and Utility Services at Scales of 1:500 and Larger; Boundary Identification and Demarcation; Map Projection Scale Factor; Scale; Geospatial Information and the Surveying Profession; Grid Systems in Ireland; Terms of Contract for Land Surveying; and Virtually Real Terrestrial Laser Scanning, among others). These are now available as co-branded SCSI and RICS publications and are providing codes of technical and professional practices to geoprofessionals in Ireland which are compliant with good-practice professional governance globally. This collaborative approach of providing professional governance may work elsewhere where statutory regulation is absent or geoprofessionals are demanding guidance to help mitigate risk within their professional duties. Further information is available from the SCSI Geomatics PG at www.scsi.ie

HELEN MURRAY O'CONNOR, FRICS, FSCSI

Spatial Information Sciences Group, School of Surveying and Construction Management, Dublin Institute of Technology, Ireland.

A chartered geomatics/land surveyor and lecturer in spatial data management, e-government service provision, land management, spatial data applications and geodetic/land surveying, she has served as chair and vice chair of the SCSI Geomatics Professional Group (PG) and as a member of the RICS Global Geomatics Professional Group (2011-2012). She is currently a member of the RICS UK and Ireland Regulatory Board, and a member of the RICS FIG delegation. Helen was appointed to the board of the Property Registration Authority of Ireland in early 2014.

✉ helen.murray@dit.ie

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- Bluetooth.



Leica Geosystems Launches Laser Scanners and Point Cloud Software



Leica ScanStations.

Leica Geosystems has announced a group of six major new products for terrestrial laser scanning: three new laser scanners and three new point cloud software products.

Leica ScanStations P40, P30, and P16 feature advances in Lidar and digital imaging as the 8th generation of Leica Geosystems laser scanners.

► <http://bit.ly/1EtAHf7>

Euclidean Unveils Hologram Room

Euclidean has announced the release of the Hologram Room, which combines Euclidean's Unlimited Detail Engine, Solidscan and Geoverse technologies to place users in a physical space occupied



Hologram Room.

by lifelike content copied from the real world. According to the company, a technology the world has been imagining for a long time has now become a reality.

► <http://bit.ly/1EtCGA1>

Two New Satellites Join Galileo Constellation



Galileo satellite in orbit.

The EU's Galileo satellite navigation system now has eight satellites in orbit following the launch of the latest pair. Galileo 7 and 8 lifted off at 22:46 CET (18:46 local time) on 27 March from Europe's Spaceport in French

Guiana on top of a Soyuz rocket. All the Soyuz stages were completed as planned, with the Fregat upper stage releasing the satellites into their target orbit, close to 23,500km altitude, around 3 hours and 48 minutes after lift-off.

► <http://bit.ly/1EtBe0m>

Confusion



In the past an aircraft was just called an 'aircraft', without the qualifiers 'manned' or 'unmanned' since the 'manned' version was the only option. Of course, the unmanned ones have been around nearly as long as the aircraft designed for travel or transportation, but they were previously flown by the military – the warlords called them 'drones' – or model airplane enthusiasts. With the emergence of unmanned aerial systems (UASs) came the need to distinguish 'manned' from 'unmanned', so today we have UASs versus MASs. Are UASs here to stay or are they just a fad, destined to join countless other products of human ingenuity buried in the graveyard of 'nice but useless' inventions? The signs clearly point in the direction of 'here to stay', so vigorously in fact that some people fear the UAS will soon replace its manned sister. Do UASs really pose a threat to regular airborne surveys? I don't think so. That fear is primarily sparked by humankind's imperfect perception of evolutionary changes and tendency to perceive life as a battle. Humans are inclined to think in terms of competition and conflicts. Humans are also inclined to look at the future from the perspective of the status quo and are generally poor at noticing gradual changes. But change is permanent. Although the future is difficult to predict, there are some anchor points. Firstly, the world population continues to grow while planet Earth refuses to expand its space. Accurate, detailed and up-to-date geoinformation is vital if we are to feed, clothe, house and transport the billions of inhabitants. Secondly, in developing countries the unstoppable move from rural villages to the

cities is accelerating in pace. Thirdly, sea level rise is a global inescapability which poses severe risks of flooding. Implementing countermeasures requires lots of geoinformation. In short, the need for geoinformation is increasing all the time, and that information can be provided by satellites, MASs and UASs. However, the features of the platforms differ and so too does the data acquired by the sensors on board.

To a certain extent, the accuracy and spatial resolution of UAS-collected data is comparable to geodata from MASs. MASs are well suited to capturing large areas with metric cameras which may weigh up to 100 kilograms for high-accuracy mapping. In contrast, the use of UASs is appropriate when small areas have to be captured with high accuracy, high detail and in three dimensions using lightweight sensors. In terms of threats to the MAS, the permanent Earth observation (EO) satellite should be mentioned first as the spatial resolution of that imagery reaches an astonishing 35 centimetres, enough for topographic mapping up to scale 1:10,000. Added to this, some EO satellites have pointing agility allowing them to capture the same site as often as once a day and to minimise the number of scenes hidden by clouds. Hence, the type of platform largely determines the temporal and spatial resolution of the geodata captured.

New technologies either flourish or vanish. They flourish when the user base expands. UAS technology has the warm interest of a broad group of professionals in the geodisciplines since it has proven reliable in capturing 3D geodata of small areas and monumental buildings. In the meantime there is some confusion about what a UAS actually is and does. "Let's purchase a drone!" exclaim colleagues who are not trained in geomatics. "You can buy them for a few hundred euros at the shop around the corner and it may boost our influx of students." Geomatics professionals do not talk about drones but rather UASs, and the UAS is more than the platform alone; it also includes the sensors to capture geodata and the dedicated, advanced software to process the raw data into useful information in a highly automated manner. When buying a UAS, it's not the platform but rather the sensors and software that liberate the banknotes out of one's wallet. ◀

The USA's National Spatial Data Infrastructure Needs Improvement

Data themes with the most diffused authority and largest number of responsible stakeholders generally have lower grades. Overall, the backbone of the U.S. National Spatial Data Infrastructure (NSDI) was assigned a C- grade following an assessment by a panel of experts initiated by the Coalition of Geospatial Organizations (COGO). The chair of COGO, Michael Vanhook, explains the context.

How important is COGO in the United States?

In our field it cannot be overlooked. COGO comprises 13 national professional societies, trade associations and membership organisations in the geospatial field, representing more than 170,000 individual producers and users of geospatial data and technology. We only take public policy positions with a unanimous vote of our member organisations.

Does COGO feel the need for a second stage in the U.S. NSDI?

The NSDI is intended to foster partnerships and form comprehensive, accurate, consistent and well-maintained national datasets. Innovations, concepts and standards generated in pursuit of an NSDI have helped to curate the geospatial landscape. While framework data have been gathered as 'best available' collections and made available for use over the past two decades, an objective vision of a digital geospatial framework that is national in scope has not yet come into existence. So yes, there is clearly a need for a second stage in NSDI development. We must have consistent national framework data layers that meet the future business requirements of the entire geospatial community. Without this authoritative data, we can't have a fully functional NSDI and agencies will continue to develop multiple datasets to meet their own particular requirements and missions.

Is money a very important barrier to progress?

Currently, there are no effective metrics to gauge the federal government's progress in implementing the NSDI. This has prevented us, as a nation, from making a compelling case for adequate funding for national efforts and for the partnerships that will be essential to the completion of the NSDI. Over the years, however, several COGO member organisations

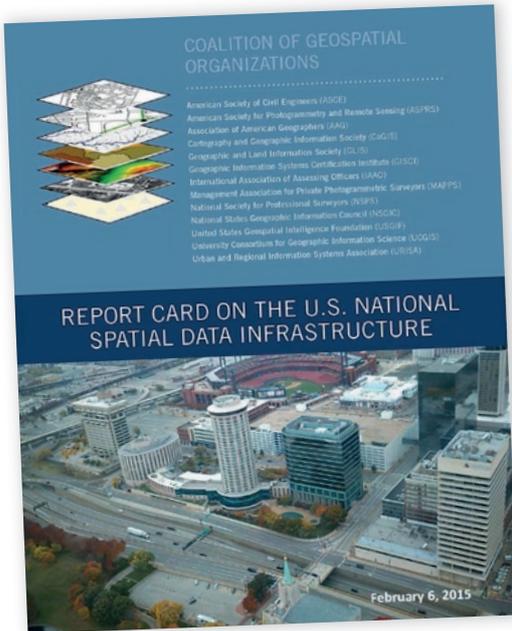
have developed performance metrics for state and local datasets. Continuing efforts to standardise and coordinate shared data resources have always been challenged by limited budgets and high expense. We all recognise the individual contributions that federal, state, regional, tribal and local government have made in concert with the private and academic sectors to develop the components of the NSDI as it exists today. And yet despite valiant efforts, no one agency, organisation, business or community can do it alone. Expenses are multiplied under individual efforts. The original vision and greatest potential value of the NSDI framework have not yet been fulfilled.

One of the key areas requiring attention in the view of the panel of experts is the need for legislation, which would make the NSDI a truly 'national' initiative. COGO wants to engage in meaningful dialogue with the federal government and Congress to ensure that clear expectations are established and that the agencies are provided with the appropriate authorities. Few problems are solved by simply throwing money at them, but once the other issues are resolved, we certainly hope that appropriate resourcing will also be provided by Congress.

What does the Report Card show?

Put simply, the left side of the Report Card





GRADE REPORT OF: National Spatial Data Infrastructure (NSDI) SEMESTER: Fall 2014

Subject	Dept.	Grade	Subject	Dept.	Grade
CADASTRAL DATA	DOI	D +	CAPACITY	FGDC	C
GEODETIC CONTROL	DOC	B +	CONDITION	FGDC	D
ELEVATION DATA	DOI	C +	FUNDING	Various	D
HYDROGRAPHY DATA	DOI	C	FUTURE NEED	FGDC	D
ORTHOIMAGERY DATA	DOI & USDA	C +	OPERATION & MAINTENANCE	FGDC	C
GOVERNMENT UNITS DATA	DOC	C	PUBLIC USE	FGDC	C
TRANSPORTATION DATA	DOT	D	RESILIENCE	FGDC	C
OVERALL DATA GRADE		C	COMPREHENSIVE GRADE		C -

TO: Federal Geographic Data Committee
590 National Center
Reston, Virginia 20192

FROM: Coalition of Geospatial Organizations (COGO)
<http://www.cogo.pro>
See the full report for an explanation of each grade.

▲ **Key to grades:** A = FIT FOR THE FUTURE – The data theme is generally in excellent condition and meets the needs for the present and the future. B = ADEQUATE FOR NOW – The data theme is in good to excellent condition, but some geographic areas of the nation require attention for significant deficiencies. C = REQUIRES ATTENTION – The data theme is in fair to good condition, but it requires attention for many geographic areas of the nation. D = AT RISK – The data theme is in poor to fair condition and mostly below the goals envisioned for the NSDI. F = UNFIT FOR PURPOSE – The data for this theme is in an unacceptable condition and provides little to no value to users.

(see Figure) represents the current state of the actual data layers, while the right side of it represents the infrastructure that is needed to support a robust NSDI. I'll give you two examples: 'Geodetic Control' was graded B+ because the data is accurate and accessible on a consistent basis across the nation and there are coordination efforts ensuring continual improvements in the control network, working very effectively with the stakeholder community. Government, industry and the general public are able to accomplish their missions and perform a wide variety of tasks and analysis requiring detailed information. Necessary improvements include replacing outdated references, expanding interoperability,

improving collection methodologies and developing geodetic surveying standards. Meanwhile, the D grade assigned to 'Transportation Data' concerns the significant duplication of data in the past, particularly road data. The grade suggests that the federal government faces challenges in adequately addressing the needs of federal agencies and partnership efforts. A central issue with regard to transportation and other data layers is that without authoritative base data, multiple datasets continue to develop to meet specific needs. There are, for instance, at least four different datasets being used by federal agencies for road centre lines, including commercially produced data.

Who or what should take the blame?

We want to be very clear that we are not faulting the federal agencies and staff that have done some truly remarkable things over the past 21 years, since the issuance of the 1994 Executive Order on the NSDI. However, as these individuals and agencies work on overarching national issues, they often lack the benefit of a very clear mandate and there has not been any consistent Congressional oversight. Framework themes with the most diffused authority and largest number of stakeholders with roles and responsibilities have the most challenges and generally lower grades. Also, the shift in the production of data from the federal agencies to the private sector and state and local government clearly calls for new partnership forms.

Evaluation

This year, the Coalition of Geospatial Organizations (COGO) in the U.S. published a Report Card that is intended to address the condition of the U.S. National Spatial Data Infrastructure and help spur additional progress. The completeness and suitability of data on the basic themes – from cadastral to transportation – was evaluated during 2014 by a seven-member expert panel chaired by (former Governor of Wyoming) James E. Geringer, who is currently the director of policy and public sector strategies with Esri. The panel also included vice-chairs Dr David Cowen, Professor Emeritus of the University of South Carolina, and John J. Moeller, former staff director of the Federal Geographic Data Committee.

The April 2015 edition of *GIM International* covered the evaluation of orthoimagery data, and in a forthcoming issue we will be reporting on cadastral data evaluation.

Is it efficient to focus this report on the federal level?

The lead agencies for the NSDI framework are federal agencies, and the Federal Geographic Data Committee has the overall responsibility for the U.S. NSDI. As Jim Geringer said at the presentation of the Report Card in Washington: "Government agencies at every level are dependent on this data, as are private sector businesses. We need state and federal government to make improvement of the NSDI a high priority so the nation can make significant, rapid progress on economic

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growth, public safety, natural resource management, health care, transportation and other areas.”

Things are moving. The COGO action almost coincided with one in the U.S. Senate; Bill 740, also known as the Geospatial Data Act of 2015, was introduced one month after the COGO Report Card. In their presentation, senators stated: “The federal government wastes vast amounts of taxpayer dollars by not properly managing and coordinating our federal investments in geospatial data.” The Bill has been introduced as a bipartisan effort to provide supporting legislation, make needed improvements and establish reporting and accountability.

What outcome are you hoping for?

Recommendations from the expert panel are that the concept of the framework needs to be reaffirmed, a new model acknowledging the importance of local partnerships needs to be adopted, and models should be transaction-based with the emphasis on current information technologies. This updated approach supports the original vision of the NSDI framework by building modern systems that facilitate local partners to create the data they need and share

it through the NSDI from the bottom up. At a minimum, what is needed is a commitment to improved spatial data, and recognition of the place of multiple stakeholders and coordinated investment strategies. These are the first steps in an ongoing process.

COGO hopes the next update for the Report Card can be issued in two years’ time. It will focus on the same issues so that it will be clear where improvements have occurred. With any

relative aspect, a completed NSDI would greatly extend the benefits and capabilities of the nation at any level, create more jobs and leverage literally trillions of dollars in economic activity by users and applications. ◀

More information

www.cogo.pro

Michael Vanhook

The chair of COGO is Michael Vanhook, a senior GIS specialist and certified GIS professional (GISP) for the state of Alabama. He is a board member of the Geographic Information Systems Certificate Institute and an active member of both the National States Geographic Information Council and the Urban & Regional Information Systems Association.

The Coalition of Geospatial Organizations (COGO) consists of the following 13 leading geospatial organisations in the U.S.: American Society of Civil Engineers, American Society for Photogrammetry and Remote Sensing, Association of American Geographers, Cartography and Geographic Information Society, Geographic and Land Information Society, Geographic Information Systems Certification Institute, International Association of Assessing Officers, Management Association for Private Photogrammetric Surveyors, National Society of Professional Surveyors, National States Geographic Information Council, United States Geospatial Intelligence Foundation, University Consortium for Geographic Information Science, and Urban Regional Information Systems Association.

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UASs for Thermal Mapping

In the Czech Republic, unmanned aerial systems (UASs) with thermal image cameras were successfully tested in a method to monitor and control damage to roads and bridges. In the autumn of 2014, the Czech company UpVision, in collaboration with The Road and Motorway Directorate of the Czech Republic (RMD), conducted thermal mapping on damage control decks of the D3 highway (South Bohemia), namely on the closed sections of the Koberný and Čekanice bridges including a 10km section of the highway.

Transport-related structures can be found worldwide, and are the foundation of any infrastructure and community. Such structures are economically demanding. They must be able to cope with the rigours of traffic while having as long a useful life as possible. Nowadays, with the emphasis on

cost savings, research is looking into new materials for safer and more durable road structures to reduce the need for repairs.

Before road repair work can start, detailed data about the road structure is needed for planners, surveyors and construction

companies. That data is used to monitor and control progress during the entire construction process, including the use of technology and compliance with deadlines. It is also necessary to monitor further construction and renovation work and in the case of associated crisis events (e.g.



▲ Figure 1, Hexacopter with thermal camera, with Jakub Karas on the left.



▲ Figure 2, Hexacopter with thermal camera.



▲ Figure 3, The image from thermal camera on the UAV is transmitted to the monitor via the internet.

landslides, earthquakes, damage to roads, etc.). It is desirable to obtain data about the structure in the most efficient way possible.

THERMAL MAPPING SOLUTION

A UAS/multicopter flying at low altitude and equipped with a thermal camera offers fast and easy remote data collection for monitoring and assessing road damage. Thermal mapping has long been used to identify damage points (based on thermal imaging differential heating of the deck) that are not visible to the human eye.

The UAS solution requires only one pilot and just a few hours to get the job done (no site assessors need to be deployed to gauge damage). The thermal images collected can be controlled manually or along a predefined route. Thanks to the overlapping images, they can be automatically georeferenced to create a damage assessment map. The captured thermal image is transmitted to the computer monitor on the ground via the internet, making it easy to mark any critical terrain points in need of repair on site.

Mapping was conducted using a small thermal camera with a micro-computer from Optris, which was placed on a special hexacopter (built by UpVision), from various calibrated heights to determine the necessary critical locations and for the control of the drone. The actual movement of the drone could then be planned. The flight can be programmed to be fully automatic or can be manually controlled to fly remotely over the necessary areas. In this case, the pilot can either remain in one place or follow the drone in a special car when flying slowly.



▲ Figure 4, UAS flight over critical points on the highway bridge.

Temperature differences reveal any damage to the road and the location of the insulation or drainage. UAS mapping took place in cloudy conditions or at sunset/dusk at the end of a clear or partly clear day, when the road surface was heated to a certain temperature. That enabled potentially damaged areas, joint insulations and various surface structures to be identified based on the different temperatures and colour scales. However, the time frame in which to perform mapping – before the road surface had cooled – was relatively short.

FLIGHT TESTING

Several flight tests were conducted combining different parameters (sunny/cloudy, road surface temperature, time before sunset/at

dusk), together with technological conditions (size of the scanned resolution/altitude, angle of recording/flying height/shot of entire road width) to determine the set of parameters that would yield the best thermal images to locate control deck damage. As the UAS flew over known points of damage, the altitude of the flight was then determined according to the online video transmission (image resolution for a given chip of the thermal camera). This enabled thermal mapping of the deck damage and calibration for further measurements.

THE KOBERNÝ AND ČEKANICE BRIDGES

The problematic Koberný bridge is approximately 600m in length and carries traffic above the Koberný Lake. Even though ▶

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this section was opened in 2013, there were still pending repairs necessary for proper road surface drainage. There were also problems in the winter when the ice formed on the road overnight due to poor water drainage. Therefore, the highway administrator refused to accept the bridge and ordered the contractor to first make repairs.

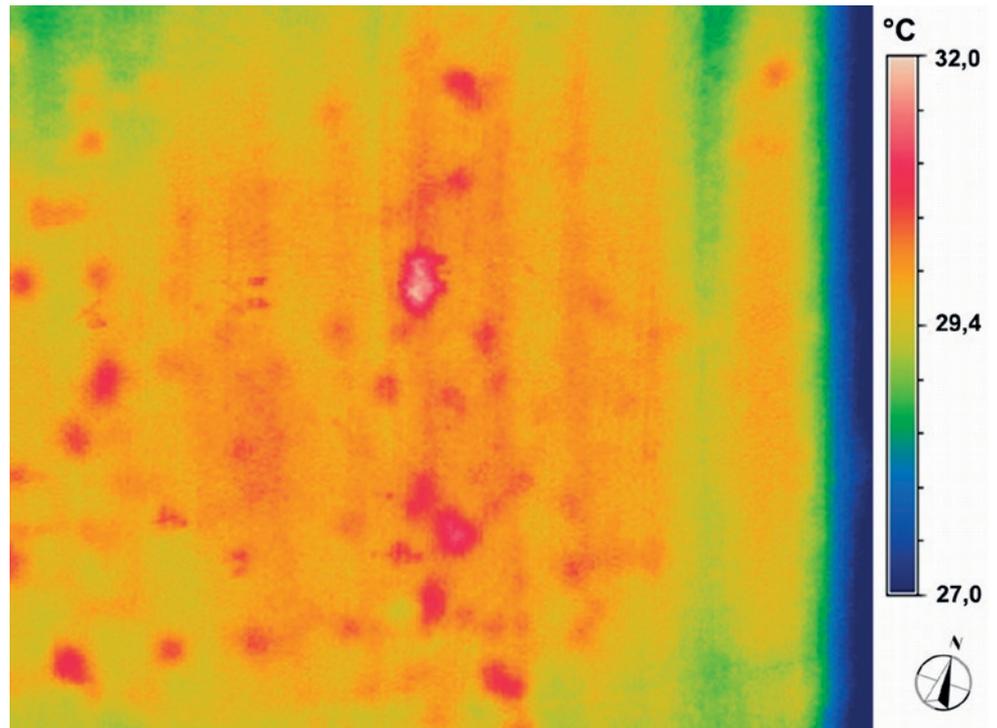
Surface milling (removing the top 8cm of asphalt) was scanned at various heights in order to check the drainage performance, save insulation and detect possible anomalies in the surface. The UAS also checked the insulation strips beneath the surface of the bridge. These could be seen on the thermal images as darker areas in the joints between the insulation materials and it was hence possible to see the entire insulation structure beneath the surface. A damage assessment map of the study area was created using the thermal images tied to orthophotos.

The Čekanice Bridge is almost 500m long and spans the railway line Prague-Linz (Czech Republic-Austria). The UAS was used to check irregular bulges on the deck and identify their range below the surface of the bridge. The proper bulge repair method can be set according to the mapped extent of damage (local repair, or major repairs of the entire section of the road). The UAS coupled with a thermographer identified bulges and their shapes below the road surface, including bulges that were not visible to the human eye. The result for both bridges was a transformed orthophoto damage assessment map in the Czech coordinate system.

HIGHWAY MAPPING

The highway mapping was done in two stages, one in each direction of the 10km stretch of road (i.e. a total flight of 20km of highway), primarily to acquire the necessary image resolution corresponding to the size of the three lanes on both sides of the highway.

The ideal climatic conditions for mapping the highway were in the afternoon or early evening. The mapping was possible for only about three hours due to the decreasing temperature in the evening and because of traffic restrictions. During these three hours it was only possible to map 10km of highway because of the UAS speed (limited to 10km/h), to avoid photo blurs and to have sufficient overlap between photos. The mapping was carried out under manual control, due to various obstacles close to



▲ Figure 5, Thermal image shows bulges and expansion joints between insulation 8cm below the surface.

the highway (bridges, power lines, toll gates, green bridges and information boards) and also because the flying height was set to around 14m.

using thermal imagery. There is still work to be done in terms of verifying all the field measurement data and further developing the data collection methodology. As a

RMD NOW PLANS TO CONTINUE DEVELOPING THE USE OF UAS IN ROAD CONSTRUCTION AND MANAGEMENT PROJECTS

Throughout the flight, the pilot and the operator were supported by vehicles receiving the images online from the UAS. Those vehicles carried continuously charged batteries for the UAS because the flight endurance in this configuration was approximately 15 to 20 minutes. The resulting data was used to create thermal orthophoto maps for damage assessment in the Czech coordinate system.

RESULTS

Road inspections were previously conducted by people on-site. Today, georadars and probes are becoming popular ways of remotely sense damage, but they are expensive and application-specific. The results of these UAS experiments on the bridges and highway demonstrate that the entire surface structure and damaged areas of roads can be accurately mapped

result of these tests, RMD now plans to continue developing the use of UASs in road construction and management projects (including reconstruction) to effectively map damage sites and plan accordingly. ◀

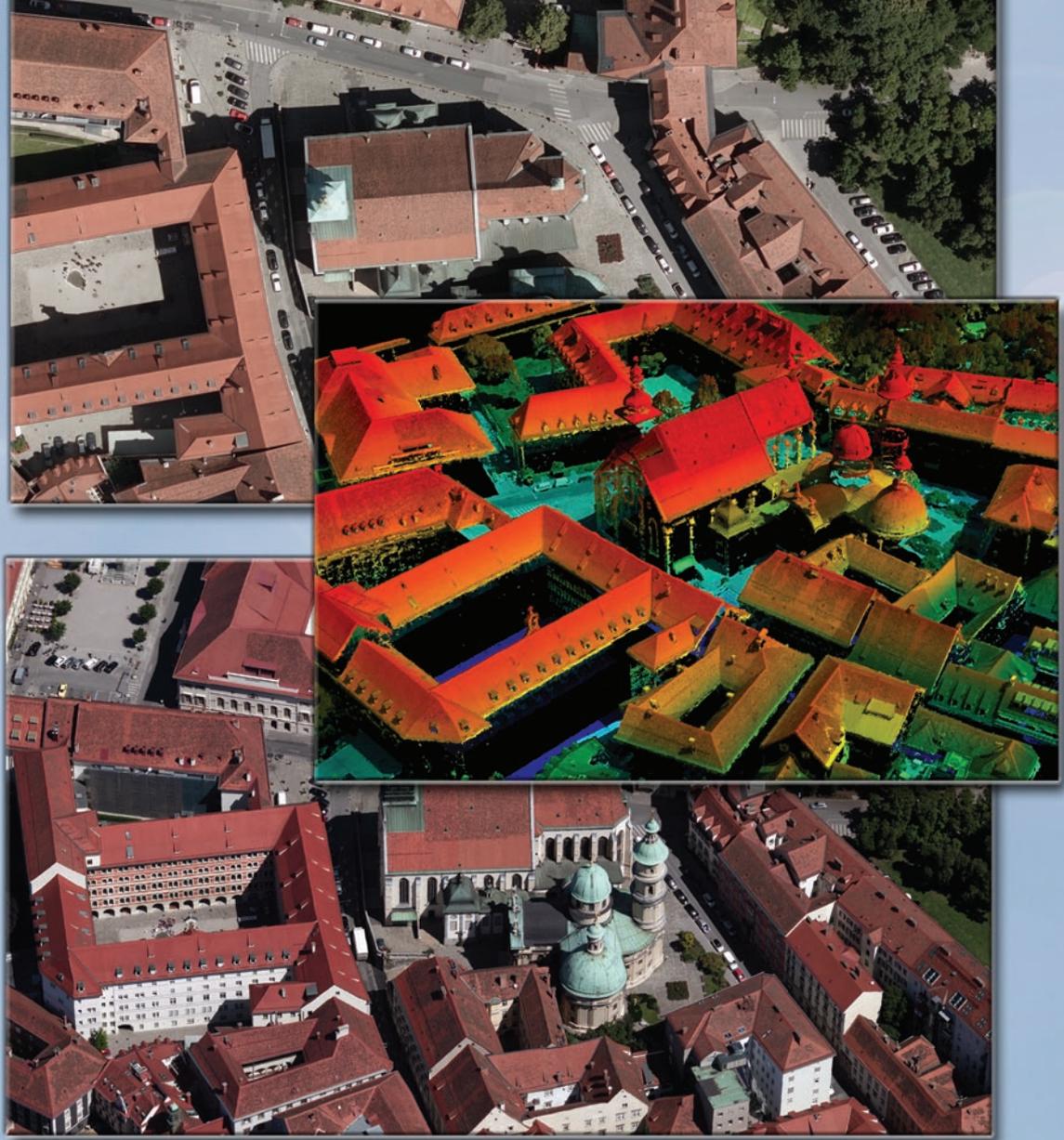
JAKUB KARAS



Jakub Karas, co-owner of UpVision, UAS manager and consultant, is specialised in photogrammetry and GIS and has been working in this field in the Czech Republic for more than 13 years (including at Eurosense, Gefos and Geodis). He is director of the Czech Unmanned Aerial Alliance, lead of the TCP1 local programme committee for ISPRS 2016 in Prague, and a member of the Czech Geoinformatic Association and The Czech Society for Photogrammetry and Remote Sensing.

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A3 EDGE CAMERA CAPTURES SAINT PETERSBURG AND BOREAL FORESTS

Benefits of Sweeping Airborne Cameras

The A3 Edge digital mapping system is a sweeping camera system able to produce high-resolution and accurate imagery from high flight altitudes and hence to conduct surveys quickly and efficiently. The system is suited for capturing urban areas as well as sparsely populated landmasses. In 2014 it was used for two projects in Russia: 3D mapping of Saint Petersburg and mapping of boreal forests. Here, the authors present an overview of their experiences.

VisionMap's A3 dual-camera system, introduced in 2008, obtains vertical and oblique views at the same time by sweeping two cameras across track simultaneously. The sweeping allows generation of a field of view (FOV) of over 100 degrees. The centre part of the total frame – up to an FOV of 40 degrees – is suited for orthoimage generation. The single frames captured

outside this FOV range, i.e. the frames towards the end of the sweep, are de facto oblique images. Five years after the launch of the A3, VisionMap introduced the A3 Edge designed to increase the area captured per hour with a higher ground sample distance (GSD). For a further description of the A3 Edge and its comparison with other systems, see the article by M. Lemmens published

in *GIM International* in 2014 [1]. Coupled with A3 LightSpeed software, the A3 Edge provides a complete end-to-end mapping solution. A3 LightSpeed automatically performs aerial triangulation (AT) and produces orthoimagery, stereo pairs and digital surface models (DSMs) from A3 images. As mapping companies take on ever-larger projects, the software has to deal increasingly with hundreds of thousands of images, which it does successfully. The complete A3 digital mapping system meets all industry standards.

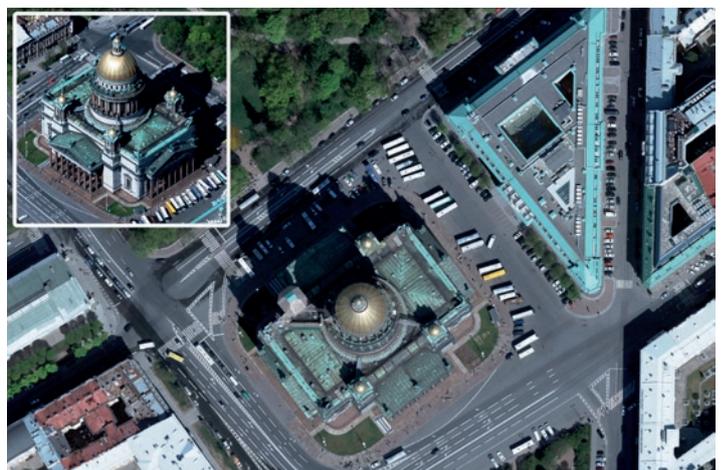
BALTAEROSERVICE

Based in Saint Petersburg, Baltaroservice has been active in the mapping market for 18 years, mainly in the northern part of Russia. The company specialises in aerial surveying and mapping of roads, railways and other linear structures and large forest areas.

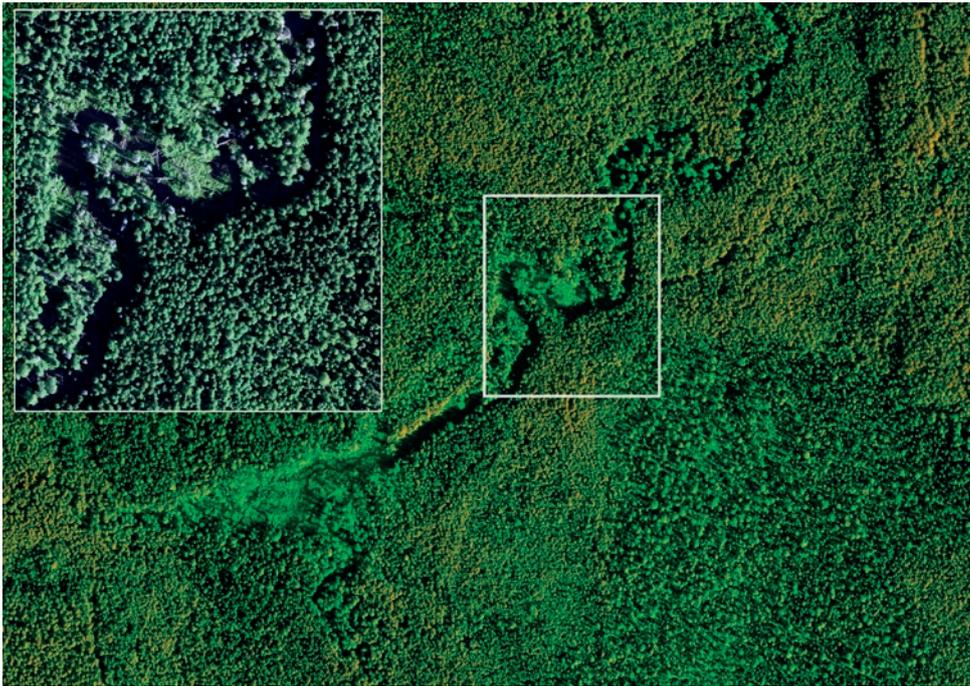
Baltaroservice owns a Cessna P210 aircraft, has access to other aircraft and has used various aerial survey and mapping technologies over the years. The company is seeing a steady increase in demand for up-to-date map products, for high-resolution, vertical and oblique images of urban areas, and for regular mapping of extensive areas.

SAINT PETERSBURG

The project was aimed at the creation of orthoimagery of the entire territory of Saint Petersburg and the preparation of vertical and oblique images for stereo and/or mono interpretation and 3D city modelling. Colour



▲ Figure 1, A3 Edge vertical and oblique images (inset); Peter and Paul Fortress (left) and Saint Isaac's Cathedral.



▲ *Figure 2, CIR orthoimage and RGB image (inset) of dense forest area.*

(RGB) vertical and oblique images were captured by crisscross flight lines spanning an area of 2,007km². During 11 hours of flight, 450,000 vertical and oblique images were captured. The challenges included: restrictions on the minimum flight altitude; the need to acquire vertical and oblique images for orthoimagery and 3D city modelling; and year-round scarcity of good flying weather. Table 1 shows the main survey parameters. The long focal length allows the A3 Edge to be flown at high altitudes while

providing a high GSD and high productivity. The simultaneous collection of vertical and oblique imagery is beneficial for 3D city modelling. Firstly, all vertical and oblique images were simultaneously adjusted by the A3 LightSpeed AT module resulting in accurate orientation parameters. Next, the vertical images were combined with a previously created DSM for orthoimagery creation. The resulting imagery was used for the creation of a 3D model of Saint Petersburg.

All map products met the accuracy requirements of 1:2,000 mapping. AT and orthoimage creation were done automatically and took one operator 15 days. In comparison, Baltaeroservice captured the same area in 2011 using a medium-format camera and the images were processed with Talca 4.0 photogrammetric software. It took five operators six months to complete that job. Figure 1 shows two examples of vertical and oblique images captured during this project.

FORESTS

The Russian Forest Agency commissioned a project to cover large forest areas by aerial survey and to create colour (RGB) and colour infrared (CIR) orthoimagery. Russia is covered by 8 million square kilometres of forest, and its inventory – using satellite imagery – and its taxation by ground survey is done annually. The high GSD of the A3 Edge and its high RGB and NIR image quality enable the labour-intensive ground survey for taxation to be replaced by stereo-photogrammetric inventories. Images with a GSD of 14cm were captured covering an area of 33,490km² within 48 hours. Table 1 shows the main survey parameters and Table 2 the main characteristics of survey, area and processing times. The orthoimagery, created using an existing DSM, was delivered in 4 bands (RGB and NIR) with a GSD of 30cm. The processing was completed within 52 days. The latest version of LightSpeed supports up to 250,000 images in a single block. With a forward/side overlap of 55%/60%, the images in the block may cover up to 55,000km². Treating such extensive areas as a single block provides high homogeneous accuracy and eliminates manual processing of adjacent blocks. Other powerful features are automatic tie point creation, even where the forest is dense, and automatic creation of cut lines. Multiple overlaps between images as well as many tie points ensure that AT generates high-accuracy results. High visual quality of the end products is obtained through

	Petersburg	Forest
Flight altitude	4,050m (13,300ft)	5,400m (17,700ft)
GSD	10cm	14cm
Forward overlap	60%	55%-70%
Side overlap	80%	55%-70%
Side oblique overlap	30%	
Distance between flight lines	1,500m	3,000m
Maximal oblique angle	55°	
Ground speed	140-150 knot	150 knot

▲ *Table 1, Survey parameters of Saint Petersburg and forest areas.*

Province (Oblast)	Area [km ²]	Distance from base [km]	Survey time [hr]	Total flight time [hr]	Processing [day]
Novgorodskaya (two areas)	10,780	250/330	16.0	36.1	14
Pskovskaya 1	1,290	200	2.4	3.8	5
Leningradskaya	4,660	170	6.4	10.9	8
Karelia	8,750	550	11.9	25.7	12
Pskovskaya 2 (two areas)	1,110	340/320	2.1	5.8	5
Archangelskaya	6,900	530	8.9	20.6	8
Total	33,490		47.7	102.9	52

▲ *Table 2, Characteristics of survey, area and processing of forest areas.*



▲ Figure 3, CIR orthoimage of a logging area.

automatic adjustment of brightness, colour and contrast, and through haze removal. The end products delivered are RGB and CIR super large frames mainly used for stereo interpretation for taxation purposes and stereo mapping and RGB and CIR orthoimagery (Figures 2 and 3). ◀

FURTHER READING

[1] Lemmens, M. (2014) Digital Oblique Aerial Cameras (2) – a Survey of Features and Systems, *GIM International*, 28.5, pp. 20-25.

ALEXANDER MAGARSHAK



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YURI RAIZMAN



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No 2793

A Water Information System Tailored for Users

In 2009 Kenya was hit by a severe drought which reduced the available water resources, thus impacting citizens and industry alike. In particular, Lake Naivasha receded to its lowest level in 75 years. The area around the lake had seen steady growth of the population and the flower industry, increasing the burden on the water resources. To address the situation a combined effort by the government, civil society and the private sector was launched which resulted in the Integrated Water Resource Action Plan Programme. Modern geospatial technologies and open-source software allow efficient system development to support the implementation of this programme.

For many years, water resources in the Lake Naivasha Basin have been monitored by collecting, processing, managing and disseminating water information using conventional tools including printed forms, spreadsheets and desktop GIS applications. This approach is very prone to errors, results in lengthy workflows and, most importantly, limits the options for data exploitation by stakeholders.

STATUS OF WATER RESOURCES

The Integrated Water Resource Action Plan Programme (IWRAP) aims at creating essential enabling conditions for

effective water regulation and governance, sustainable land and natural resource use and sustainable development in the Lake Naivasha Basin. To create the appropriate conditions for monitoring the water resources, a modern, web-based system water information system has been developed called MAJI-SYS (Maji is the Swahili word for 'water') built entirely on open-source software. The system gives stakeholders insight into the status of water resources in the basin in near real time, and for the staff of the Water Resource Management Authority (WRMA) the system supports storage, processing

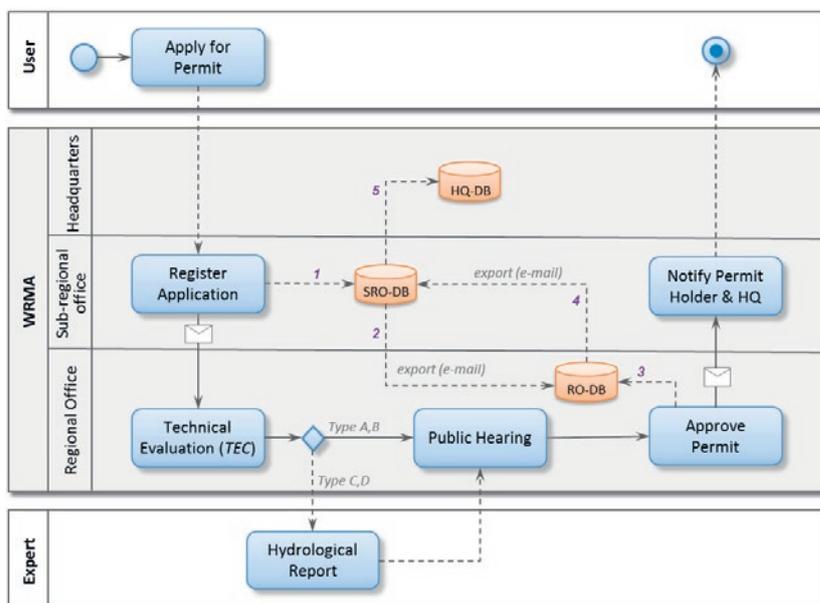
and analysis of data in an efficient and contemporary manner. MAJI-SYS is one of the deliverables of IWRAP, which focuses on supporting information management and dissemination of information about the water resources in and around the Lake Naivasha Basin.

STAKEHOLDERS' NEEDS

Monitoring of water resources in the lake basin is the responsibility of the Naivasha sub-regional office of WRMA. To keep stakeholders up to date about the water resources situation, the MAJI-SYS was developed based on an in-depth analysis of existing operational workflows. This analysis focused on understanding the internal workflows for the provision of services to stakeholders, identifying the key datasets manipulated in these workflows, and determining the necessary approach to modernise the existing systems.

WORKFLOWS

Figure 1 shows a model of one of the studied workflows, depicting the relationships between the various hierarchical levels of WRMA. The figure also shows the existence of three data repositories, one at each level. Interestingly, these three repositories hold mostly the same data but in different formats. This includes spreadsheets and binary transfer formats at the level of sub-regional offices, and in proprietary database format at the headquarters. One of the many difficulties here is that the



▲ Figure 1, Permitting workflow.

sub-regional offices lack the software to access some of those formats resulting in them collecting the data but being unable to perform any analysis.

FUNCTIONALITY

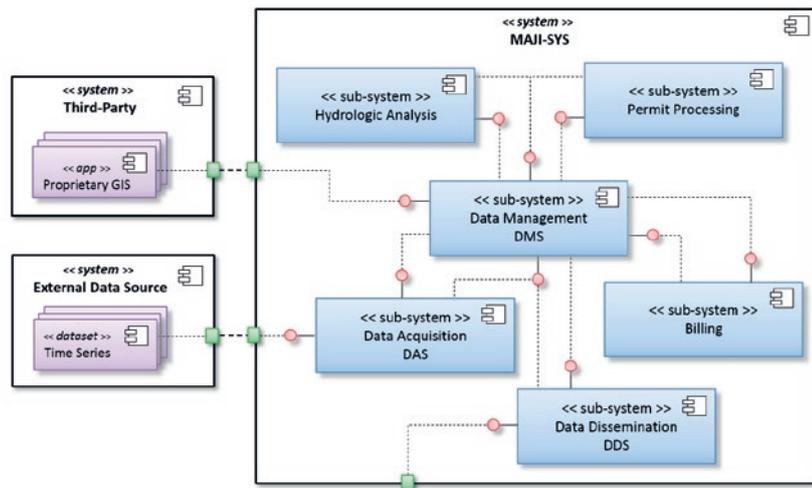
Based on the analysis, the users and functionality of MAJI-SYS were defined. MAJI-SYS focuses primarily on addressing the needs of the different users. Field officers can collect and store observations of, for example, hydrological variables. Water resource managers can build a picture of the current condition of the basin by analysing data from the multiple observed hydrological variables. Water users can see allocated volumes and their relationship with the conditions of the basin. As such the information provided by MAJI-SYS centres on:

- 1) Monitoring the quantity and quality of water resources in the basin
- 2) Assessing the long-term impact on the basin based on different policy options and water allocation scenarios
- 3) Informing stakeholders and the general public about the actual status of the water resources.

ARCHITECTURAL DESIGN

The architecture of MAJI-SYS is designed to facilitate the consumption of data resources, use of software tools and dissemination of data products via compliant service interfaces. Intrinsic to the working environments is that these services can be created, delivered, governed and maintained by different parties. To achieve this MAJI-SYS uses a layered architecture, where a layer is defined as a very coarse-grained group of components put together to address one specific concern of the system. Components within a sub-system collaborate and deliver value to components in other layers or may also consume services from these layers. Components connect, interact and exchange messages by using standardised interfaces. This characteristic also makes it possible for MAJI-SYS to assimilate and accommodate changes in components or to incorporate new ones that might occur, for example, as a result of technology life cycles, such as new software versions. This component-based approach substantially simplifies the maintenance of the system, which is a condition for implementation.

Figure 2 shows the high-level architecture of MAJI-SYS including each of the sub-systems with a specific role.



▲ Figure 2, MAJI-SYS architecture.

DATA ACQUISITION

The Data Acquisition Sub-system provides the interfaces to support the various time-series data acquisition and editing methods (quality control of field-collected data) for the monitoring data. This includes field data collection using smartphones, manual data entry through web forms, and import forms. Import forms allow data to be loaded from bulk files or telemetric stations. Bulk files result from loggers attached to monitoring stations. Although the loggers record observations periodically, e.g. every two hours, the data is uploaded to MAJI-SYS only once or twice a month. Telemetric stations send data directly to MAJI-SYS via the internet or 3G networks.

DATA PROCESSING

The Hydrologic Analysis Sub-system encapsulates the processing functions of MAJI-SYS. These functions are used in analysis, planning, reporting, mapping and modelling tasks; to understand water resource availability holistically through

integrated views of diverse data sources; and to provide the basis for water allocation and permitting.

DATA DISSEMINATION

The Data Dissemination Sub-system (DDS) deals with the provision of services to stakeholders or other systems. The dissemination options include: standardised OGC services that can be used via Application Programming Interfaces (APIs) to obtain maps, time series, etc.; a viewer to enable non-expert users to visualise the status of water resources, permit information (e.g. status, validity), etc.; and an analysis tool allowing users to experiment with the data to generate customised products and visualisations. Figure 3 shows snapshots of the DDS interfaces.

DEVELOPMENT

MAJI-SYS has been developed and implemented in very close collaboration with technical staff of WRMA, including input of local private-sector expertise



▲ Figure 3, Snapshots of MAJI-SYS Data Dissemination (DDS) interfaces. On the left, analysis and visualisation of monitoring data by means of statistical functions. On the right, a profile of water levels at a user-selected location.

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in Kenya where necessary. MAJI-SYS is currently in its final development phase and is expected to be fully functional by the end of 2015. As it becomes more integrated within the operational workflows of WRMA, it is increasingly becoming the supporting tool for the management of water resources at local and regional levels. It is becoming fundamental in the improvement of water monitoring practices by allowing greater up-to-date understanding of the conditions in terms of the quantity and quality of fresh water. The next step is to start using it to develop scenarios and analyse the long-term impact on the water resources in the basin that may arise from policies, water-use practices and industry development.

CONCLUDING REMARKS

Modern geospatial technologies allow for efficient and effective system development of the type of system as presented here. Today's challenges related to population growth, urbanisation, climate change and disaster management require sophisticated

tools for monitoring purposes. Those tools need to be cheap and manageable. The MAJI-SYS is designed and developed in such a way that the system can be maintained by geospatial professionals in Kenya; WRMA does not have to depend on third parties for system maintenance.

ACKNOWLEDGEMENTS

The development of MAJI-SYS is a collaborative effort under IWRAP with inputs from WRMA, Imarisha, WWF Kenya, Deltares, Upande and the Faculty ITC of the University of Twente. The programme is supported by the Dutch Embassy in Kenya. ◀

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No 2747

The World of UAS Survey Systems

Global Vision is an aerial and hydro survey company based in Pretoria, South Africa. The company focuses on capturing unique forms of survey data with the use of advanced surveying technology, currently in the form of UAS survey systems. With this technology Global Vision is capable of achieving its main company goal which is to generate highly accurate yet cost-effective data which can be made available on demand.

Global Vision is a sister company to iGlobe, a GIS system management and integration company. In 2011 the founders of Global Vision, namely Craig Vorster and Vaughn Vorster (along with iGlobe founders Edward Murray and Stanley du Toit) launched a research and development programme with the vision of developing an accurate yet cost-effective aerial and hydro survey method to serve iGlobe and its clients. The survey method was designed around remote control technology both in the air and on the water.

These systems passed the testing phase with flying colours and the programme proved to be ultra-successful. In 2013, Global Aerial and Hydro Vision Pty (Ltd) was established and began trading as Global Vision.

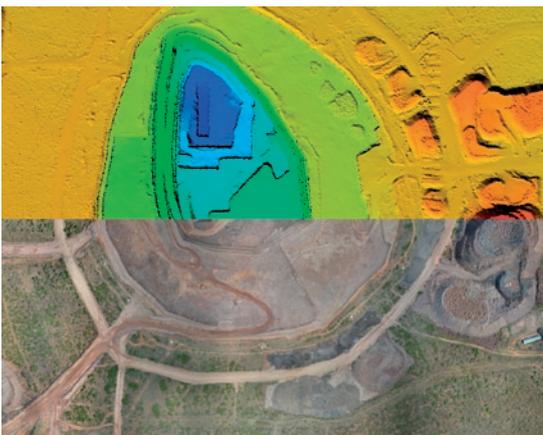
STRONG GROWTH

While Global Vision started out with merely four employees, over the past 18 months Global Vision has grown to a total of 10 employees. They are all dedicated to UAS survey solutions, ranging from UAS pilots and instructors to mine surveyors and photogrammetry processing consultants, thus forming a true dream team. Furthermore Global Vision continues to grow and is expected to double in size by 2017.

Geographically Global Vision started out by providing a service to just one client in the North West Province of South Africa but this grew rapidly to cover most of the country, while mainly targeting Northern Cape, Mpumalanga and Limpopo provinces. Over the last 10 months this has increased to a much larger footprint and Global Vision currently services most of Sub-Saharan Africa, including Botswana, Namibia and Ghana.

INTEGRATION PACKAGE

The Global Vision mission is to offer clients a complete end-to-end UAS survey solution in terms of both products and services. The aim is to add significant value with a solution



▲ UAS survey shows a DTM and orthophoto of an open-cast pit.



▲ Global Vision directors.

Every month **GIM International** invites a company to introduce itself in these pages. The resulting article, entitled Company's View, is subject to the usual copy editing procedures, but the publisher takes no responsibility for the content and the views expressed are not necessarily those of the magazine.

that enforces standards; one which ensures quality and productivity and empowers manager by delivering highly accurate, timely and coherent data to enable them to make the right business decisions. However, since UAS survey systems are increasingly being acquired by organisations and companies worldwide, Global Vision has developed an Integration Package for UAS products which includes internationally branded UAS products, pilot licensing and operation certification, UAS aerial survey workflow training as well as pilot and photogrammetry processing training. The integration programme is aimed at giving clients the necessary skills and knowledge to be capable of successfully operating the UAS survey solution to its full potential.

SPECIALISED EMPLOYEES

Global Vision has a very simple yet effective management philosophy and style. Global Vision's ethical values consist of honesty, responsibility, precision and professionalism. When setting its objectives, Global Vision aims to work in unity towards a common goal while utilising the full skill set of the team. Furthermore Global Vision follows very strict procedures to ensure quality control and safe operations, such as pre-flight checklists, UAS log books, UAS maintenance plan, data processing checklists and more. When assigning responsibilities and duties to individual employees, Global Vision aims to create specialists. Therefore, Global Vision assigns a limited amount of responsibilities to each employee yet gives them the tools, opportunities and training needed for them to gain a vast amount of experience and knowledge within a specialised field. Global Vision supports employee growth in the form of studying, training and other educational channels. Global Vision's small yet extremely specialised 10-man team is based around a flat yet tight management structure, making it easy to adjust and adapt to the rapidly changing UAS industry.

TARGET MARKETS

Global Vision's survey solutions are used in various industries such as mining, petrochemical, town planning, engineering, wildlife, agriculture and many more. The main target market is within the mining and petrochemical environment where mine planning and volumetric calculations of open-cast mines, stockpiles, waste dumps and tailing dams are done on a weekly or monthly basis, as well as inspections and



▲ Global Vision works with the Altura Zenith ATX8 UAS survey system.



▲ UAS survey, point cloud of a stockpile yard.

the generation of deformation maps in the structural environment by means of UASs. The information is then fed back into the GIS systems, where the information can be shared and utilised by the entire group. Global Vision has also identified a need for high-quality aerial surveys in the town planning environment; in view of the amount of urban development currently taking place in Africa, regional councils and town planners have become a large target market for Global Vision.

THE FUTURE OF UASS

The future of the UAS market is difficult to predict due to the extremely rapid development in the industry. Nevertheless, looking ahead, Global Vision regards the dramatic increase in the size of areas that can be mapped and surveyed by a UAS as one of the most significant improvements. When Global Vision started aerial mapping and surveying back in 2011, an area of 100 hectares was considered large. Nowadays it is possible to map and survey 1,000 hectares

in one flight, and an aerial survey project of 10,000 hectares is even considered feasible for a UAS.

R&D FOCUS

Global Vision has shifted its R&D focus from the hard-core development of UAS survey systems to being more focused on the integration of internationally branded UAS products into the markets in Sub-Saharan Africa. A large part of the R&D programme is targeted on optimising the photogrammetry methods and workflow aimed at a continual improvement in data accuracy and quality.

Global Vision's objective for the next five years is to achieve an annual 25% increase on turnover per year. The company's long-term goal is to become the largest UAS survey services provider in Africa. ◀

More information
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Review of the World Bank Conference on Land and Poverty

The 16th Annual World Bank Conference on Land and Poverty was held from 23-27 March 2015 at the World Bank Headquarters in Washington D.C., USA. The World Bank reports that over 1,200 participants attended from 123 countries. The participants represent many disciplines and included leaders and professionals from across governments, civil society, academia, the private sector and partners to interact and discuss innovative approaches to improving land governance. FIG president Chryssy Potsiou joined the event as did FIG representatives such as honorary president Prof Stig Enemark.



World Bank Conference on Land and Poverty 2015 – Plenary session (image courtesy: World Bank).

Land governance, land investment, land policies and food security, land reforms and land administration were all prominent on the agenda in relationship to sustainable growth and management of the environment. Well-defined land rights are needed to address global challenges including climate, urbanisation, social justice and so on.

Land administration and cadastre is one of the areas where the debate is focused on implementation at country level. Tenure regularisation is still relatively expensive and slow. Pro-poor land rights are the hardest and riskiest to implement. The high-level principles as included in the voluntary guidelines on the responsible governance of tenure of land, fisheries and forests from FAO, in the Continuum of Land Rights from UN Habitat and in FIG's Fit-For-Purpose Land Administration are all in support of cost-effective and achievable implementations. There is a growing understanding that complete coverage and readiness for use is relevant in order to provide tenure security for all. This can

be clearly seen in the requirements for monitoring. Reliable land indicators require further standardisation.

A lot of attention was paid to the matter of 'legitimate' land rights. Land rights are sometimes legitimate but extra-legal, such as informal land rights in slums. Conversely, land rights can be legal yet not legitimate, such as formalised land rights after land grabbing.

The issue of open data was also considered. However, that means by definition that some data must be available, which is often not yet the case. The question of which data should be open depends on the local situation (ethics, culture, etc).

The papers and discussions also included coverage of biometrically linked property data, with cases from India. Incidences of fraud and corruption cannot always be avoided, even in completely transparent environments. Crowdsourced land data requires verification

options in order to ensure high-quality and authoritative data. Mediation of data from different sources can be a possibility here. Implementation of crowdsourcing is a long journey since there are many stakeholders. If the institutional issues are not solved soon, crowdsourcing and fit-for-purpose approaches will be the game changer. As in other areas there is also a Continuum of Crowdsourcing when implementation variations are considered. In general, the 'technology' was no longer regarded as a problem. The combination of crowdsourced data and high-resolution and up-to-date satellite imagery looks promising. It is important to recognise that agencies want to be sure that systems and data belong to them, rather than 'to the cloud'. Once again, technical solutions are available. ◀

More information
www.fig.net



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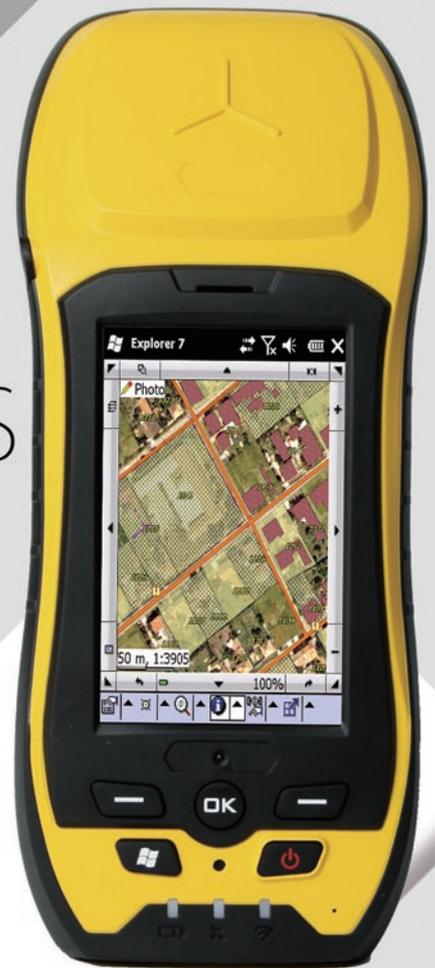
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A Step towards Cross-organisational Coordination

Are you a manager looking for a venue to share a geospatial application you have developed, a company seeking to exhibit your wares, or a student hoping to discuss your research results? Then GSDI's online calendar is a resource not to be missed [1]. The calendar provides a comprehensive listing of global and regional conferences, symposiums, workshops and other related gatherings. It takes a broad thematic view, covering spatial data handling, crowdsourcing, data visualisation, open data policy, business models, research cyberinfrastructure and RS/GIS applications.



GSDI 2014 Assembly.

The calendar is one way GSDI supports information flow and coordination between organisations, which is one of the aims of the Joint Board of Geospatial Information Societies (JBGIS) [2] to which the GSDI Association belongs. The calendar not only allows organisations to inform others of upcoming activities, but it also provides an avenue to synchronise and piggyback on events. Granted, just knowing when other events are taking place does not guarantee that coordination is feasible. Effective joint action has to factor in the potential barriers to coordination, such as resource allocation, planning processes and the added coordination effort.

The calendar reveals unfortunate overlaps. For instance, the Eye on Earth Summit 2015 [3] is scheduled for 6-8 October 2015 in Abu Dhabi, UAE, while the 9th Symposium of the International Society for Digital Earth [4] will be taking place on 6-10 October in Halifax, Canada, and the 20th UN Regional Cartographic Conference for Asia and the Pacific [5] on 5-9 October in Jeju Island, Republic of Korea. No doubt some people will wish they could participate in all of these events, but they will need to make choices. Further ahead in time, there is a scheduling conflict between the

International Geoscience and Remote Sensing Symposium [6] in Beijing, China, and the Esri International User Conference [7] in San Diego, USA. This means that one of the biggest remote sensing conferences and one of the biggest GIS conferences will take place the same week, from 27 June to 1 July 2016. It is a good sign that the geospatial community is large enough to support multiple, overlapping events, but such overlaps still point to an opportunity for greater synergy and alignment.

Individuals can use the calendar to select from the range of opportunities for interaction. However, it is important to strike a balance between participating in too few and too many conferences. Travelling to too many conferences increases one's risk of becoming a proverbial 'headless chicken', but travel to too few conferences and one's sphere of influence may shrink. Conferences still have value in terms of networking, obtaining feedback and publicity. At a time when it is easy to get information on the internet, one can never discount the serendipity factor of running into people and having ideas spark during a coffee break.

To add to the list above, the GSDI 15 World Conference is currently scheduled to

take place in Taipei, Taiwan, at the end of April 2016. And finally, thanks to all those conference organisers who plan to webcast at least part of their events and/or record their sessions for those of us who cannot be there! ◀

Signs you're attending too many conferences: Your carry-on suitcase is never fully unpacked. You've got enough pens and mugs (and soap from hotel rooms) for life. The word 'booth' brings to mind 'exhibition', not a restaurant seating option. You've got a pile of unused conference swag bags in your closet. Stray business cards are scattered across your desk. Residual foreign currency has become more than just chump change. You've got more air miles than vacation time to use them.

More information

- [1] www.gsdi.org
- [2] www.fig.net/jbgis/
- [3] www.eoesummit.org
- [4] digitalearth2015.ca
- [5] <http://unstats.un.org/unsd/geoinfo/RCC/>
- [6] www.grss-ieee.org/conferences/future-igarss/
- [7] www.esri.com/events/user-conference/registration/future-dates



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UN General Assembly Urges the Sharing of Geospatial Data to Benefit People and Planet

The science that supports the precise positioning and mapping of people and places should be shared more widely, according to the United Nations General Assembly as it adopted its first resolution recognising the importance of a globally-coordinated approach to geodesy on 26 February 2015. It was acknowledged that geodesy plays an increasing role in people's lives, from finding disaster victims to finding directions using a smartphone. The General Assembly resolution, 'A Global Geodetic Reference Frame for Sustainable Development', outlines the value of ground-based observations and satellite remote sensing when tracking changes in populations, land use, ice caps, oceans, the atmosphere and the environment over time. Such geospatial measurements, when referred to a high-quality geodetic reference frame, can support sustainable development policymaking, climate change monitoring and natural disaster management, and also have a wide range of applications for transport, preserving the natural and built environments, supporting agriculture and resource exploitation, and for land use planning, infrastructure provision and construction.

Emphasising that "no one country can do this alone", the General Assembly called for greater multilateral cooperation on geodesy, including the open sharing of geospatial (including geodetic) data, further capacity-building in developing countries and the creation of international standards and conventions. Recognition was also given to the ad hoc nature of the establishment and operation of ground-based geodetic infrastructure such as GNSS permanent receivers, radio telescopes supporting baseline interferometry measurements,

satellite laser ranging stations, geodetic control networks and gravity reference stations. Without such infrastructure the basic data used to maintain the International Terrestrial Reference Frame (ITRF) would not be available. Space-based infrastructure is also important, and the data from a wide range of Earth observation satellites make crucial contributions to geodetic applications for science and society.

Co-sponsored by 52 Member States, the resolution was originally put forward by Fiji. Ambassador Peter Thomson, Fiji's Permanent Representative to the United Nations, explained that, as a Small Island Developing State, Fiji is vulnerable to increasingly severe natural disasters, sea-level rise and other problems triggered by climate change, but uses geodesy data to plan as best as it can. "We fully realise the importance of critical geospatial infrastructure and information in helping countries and decision-makers make more informed, evidence-based decisions on mitigation and preparedness," Ambassador Thomson stated.

Fiji also highlighted the power of precise positioning for United Nations peacekeeping, for which it contributes troops. "We believe that additional accurate geospatial data will help the Blue Helmets take decisions in an often volatile operational context, leading to greater effectiveness of UN missions," added Ambassador Thomson.

Wu Hongbo, the United Nations Under-Secretary-General for Economic and Social Affairs, praised Member States' efforts to "discuss, deliberate and decide on issues relevant to geospatial information," and,



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noting that geodesy is fundamental for monitoring changes to the Earth, stressed "the significance of the global geodetic reference frame in supporting sustainable development".

2015 is a crucial year in which world leaders will be called upon to determine the global course of action to improve people's lives and protect the planet. With key finance, sustainable development and climate change conferences approaching, the focus on practical solutions and international cooperation in today's resolution sets the right tone.

In short, what is needed is upgraded geodetic infrastructure, sustained global operations of these facilities, open data sharing policies, the launch of improved geospatial satellite technologies, and greater education and out-reach to less-developed countries so that they may be able to take advantage of the products and services of modern geodesy. ◀

More information

Committee of Experts on Global Geospatial Information Management (<http://ggim.un.org>) and the Working Group on Global Geodetic Reference Frame (http://ggim.un.org/UN_GGIM_wg1.html)



The mission of the Association is the advancement of geodesy.

IAG implements its mission by:

- advancing geodetic theory through research and teaching,
- collecting, analysing and modelling observational data,

- stimulating technological development, and
- providing a consistent representation of the figure, rotation and gravity field of the Earth and planets, and their temporal variations.

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Conference Experiences

The cartographic calendar is dominated in 'odd' years by the biennial International Cartographic Conferences. In the intervening 'even' years, many events of interest to the cartographic community are presented, around the world, and endorsed by ICA. The latest issue of *ICA News* reports on a number of these symposia [1].

The 3rd Regional Symposium on Cartography for Australasia and Oceania was held in Auckland, New Zealand, in September 2014, jointly with the 7th National Cartographic Conference (of the New Zealand Cartographic Society [2]) – GeoCart'2014 – and the 42nd ANZMapS Conference (Australia and New Zealand Map Society [3]). As a regular, high-profile event, this meeting attracted 75 delegates from New Zealand and overseas countries, including Australia, Austria, Canada, Norway, UK and USA, and was also attended by the ICA president.

The Symposium presented 51 keynotes, papers and posters across three days. The varied programme included parallel sessions under the headings Historical, Social & Environmental, National & Environmental Mapping, Archiving & Mapping of the Environment, Visualisation & Modelling, Mapping of Conflict & Disaster, and Remote Sensing & Georeferencing. Plenary keynotes topics included History of Women in Cartography, the Relevance of Cartography, Cartography in National Mapping Agencies, and the Changing Representations of Islands. With an excellent map exhibition, commercial fair, local excursions and social programme, there was something for everyone. Publication of the Proceedings by the NZCS is imminent, and some contributions will also appear

in the journal *Globe*. A reflective video [4] demonstrates that the 2016 event will be well worth attending.

The 10th Jubilee International Conference about Cartography and Geoinformation was organised by the Croatian Cartographic Society in October 2014 in Zagreb, Croatia. Again reflecting the wide scope of cartography as a discipline, the conference included 20 lectures, an exhibition of geological maps, an orienteering competition, an awards ceremony for the best children's maps, an associated seminar on the Role of Geodesy and Geoinformatics in Sustainable Development, and a full-day walking tour on the Medvednica mountain. Keynotes at the seminar were delivered by Suchith Anand, chair of the Commission on Open Source Geospatial Technologies; Joep Crompvoets, secretary-general of EuroSDR (with whom ICA has an MoU); Dušan Petrović of the Mountain Cartography Commission; Yerach Doytsher, chair of sister society FIG's Commission on Spatial Information Management; and the ICA president.

Earlier, in June 2014, the 5th Jubilee International Conference on Cartography and GIS was held near Varna, Bulgaria. The 170 attendees from 42 countries included ICA Executive Committee members, along with several ICA Commission chairs. Keynotes by Laszlo Zentai (ICA secretary), Barbara Ryan (director of GEO, USA), Michael Gould (Esri, USA), Robert Nagy (Hexagon Geospatial, Hungary) and Sisi Zlatanova (TU Delft, The Netherlands) highlighted the scope of the meeting. 18 oral sessions and 5 posters sessions are reported in the Conference



▲ Before the flood: participants at the 5th Jubilee International Conference on Cartography and GIS, Riviera Resort, Bulgaria.

Proceedings [5], with highlights published in the Springer volume *Thematic Cartography for the Society* [6]. An associated student competition, ICA Commissions meetings and social tours and activities promoted a high-quality symposium. A major incident for all attendees was a substantial flood which struck at the end of the gala dinner, destroying roads and cutting off whole villages around the venue. The Bulgarian Army used two military helicopters to rescue the conference participants, with the exception of two intrepid cartographers (one Swiss and one Austrian) who managed to escape across the dangerous landscape on foot. Hence, adventure, disaster management and study were combined at a memorable cartographic conference. ◀

More information

1. <http://icaci.org/ica-news/>
2. www.cartography.org.nz
3. www.anzmaps.org
4. www.cartography.org.nz/component/k2/item/48-geocart-2014-highlights
5. http://cartography-gis.com/events_en/
6. www.springer.com/gb/book/9783319081793
www.icaci.org



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ISPRS Scientific Initiatives in 2015

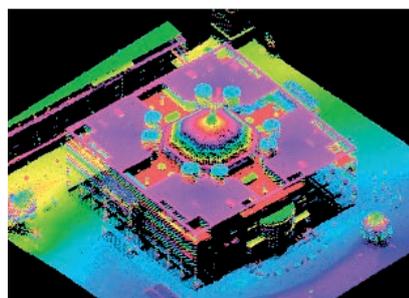
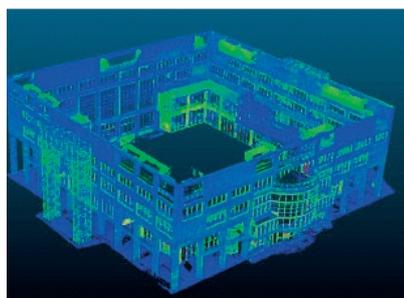
In accordance with the statutory mission and activities of ISPRS, the Society provides funds to support scientific and other initiatives which will further improve its international status in the field of the photogrammetry, remote sensing and spatial information sciences and will therefore benefit all ISPRS members.

To this end, a budget of CHF25,000 was set for 2015 projects and a call for new ISPRS Scientific Initiatives was issued in October 2014. By the deadline, 11 teams of researchers from working groups across all of the eight ISPRS Technical Commissions had submitted cases for support.

Comments were sought from the relevant Technical Commission presidents and a sub-committee of three council members was convened to independently review the proposals on the basis of scientific excellence.

The sub-committee then convened at the recent Technical Commission VIII Symposium in Hyderabad, India, to draw up a ranked list of projects to be funded. The sub-committee's recommendation to fund seven projects to a total of CHF33,000 was then accepted by ISPRS Council at its meeting in Hyderabad. The successful projects were:

- Completion of the ISPRS Benchmark for Multi-platform Photogrammetry
- ISPRS Open Data Challenge 2015
- ISPRS Benchmark on Urban Object Detection and 3D Building Reconstruction
- Global Status of Land Cover Mapping and Geospatial Database Updating
- Advances in the Development of an All-purpose Open-source Photogrammetric Tool
- Assessment of Learning Pedagogy in Geoinformatics



Imagery from the 2014-15 Scientific Initiative, 'ISPRS Benchmark for Multi-platform Photogrammetry'.

- Development of an Innovative Method for Vicarious Radiometric Cal of Orbital Hyperspectral Sensors.

The ISPRS Council would like to congratulate the successful applicants. The decision to allocate more funding than originally budgeted reflects the high quality of the proposals received and takes the total funding of Scientific Initiatives for 2014 and 2015 to more than CHF80,000. Outcomes from the projects will be reported in late 2015/early 2016.

At the same time as the new 2015 Scientific Initiatives were starting, the six projects that were funded in 2014 were drawing to a close. Those projects ranged from the creation of a

benchmark on high-density image matching to the development of a curriculum for the African Geospatial Sciences Institute. Reports on progress made to date in the 2014 Scientific Initiative projects can be found at [1]. ◀

More information

1. www.isprs.org/documents/reports/SI-2014/default.aspx
www.isprs.org



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► **MAY**

AUVSI'S UNMANNED SYSTEMS 2015

Atlanta, GA, USA
 from 04-07 May
 For more information:
 W: www.auvsishow.org

ASPRS 2015 ANNUAL CONFERENCE

Tampa, FL, USA
 from 04-08 May
 For more information:
 W: www.asprs.org/asprs-conferences.html

MUNDGEO#CONNECT LATIN AMERICA

Sao Paulo, Brazil
 from 05-07 May
 For more information:
 E: connect@mundogeo.com
 W: <http://mundogeoconnect.com/2015/en>

RIEGL LIDAR 2015

Hong Kong and Guangzhou, China
 from 05-08 May
 For more information:
 E: riegllidar2015@riegl.com
 W: www.riegllidar.com

ISRSE 2015

Berlin, Germany
 from 11-15 May
 For more information:
 E: isrse36@dlr.de
 W: www.isrse36.org

FIG WORKING WEEK 2015

Sofia, Bulgaria
 from 17-21 May
 For more information:
 E: fig@fig.net
 W: www.fig.net/fig2015

GEO BUSINESS 2015

London, UK
 from 27-28 May
 For more information:
 E: dsmith@divcom.co.uk
 W: <http://geobusinessshow.com/conference/>

► **JUNE**

HXGN LIVE

Las Vegas, NV, USA
 from 01-04 June
 For more information:
 E: contactus@hxgnlive.com
 W: <http://hxgnlive.com/las.htm>

28TH INTERNATIONAL GEODETIC STUDENT MEETING (IGSM)

Espoo, Finland
 from 01-06 June
 For more information:
 E: felix@igsm.fi
 W: www.igsm.fi

INTERNATIONAL CONFERENCE ON UNMANNED AIRCRAFT SYSTEMS

Denver, CO, USA
 from 09-12 June
 For more information:
 W: www.uasconferences.com

OPTECH IMAGING & LIDAR SOLUTIONS CONFERENCE

Toronto, CA, Canada
 from 09-12 June
 For more information:
 E: inquiries@optech.com
 W: www.optech.com

WORLD GEOSPATIAL DEVELOPERS CONFERENCE 2015

Beijing, China
 from 10-11 June
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 E: lily.liu@3snews.net
 W: <http://wgdc2015.3snews.net>

35TH EARSSEL SYMPOSIUM 2015

Stockholm, Sweden
 from 15-19 June
 For more information:
 E: secretariat@earsel.org
 W: www.earsel.org/symposia/2015-symposium-Stockholm/index.php

ADVANCING GEOGRAPHIC INFORMATION SCIENCE: THE PAST AND NEXT TWENTY YEARS

Vespucci Institute Bar Harbor, Maine, USA
 from 29 June – 03 July
 For more information:
 W: <http://giscienceconferences.org/vespucci2015week2/>

► **JULY**

FOSS4G-EUROPE CONFERENCE

Como, Italy
 from 14-17 July
 For more information:
 E: contact-foss4ge@osgeo.org
 W: <http://europe.foss4g.org/2015/>

ESRI INTERNATIONAL USER CONFERENCE

San Diego, CA, USA
 from 20-24 July
 For more information:
 E: uc@esri.com
 W: www.esri.com/events/user-conference

13TH SOUTH EAST ASIAN SURVEY CONGRESS (SEASC 2015)

Marina Bay Sands, Singapore
 from 28-31 July
 For more information:
 E: pat@eventspeople.com
 W: www.seasc2015.org.sg/index.html

► **AUGUST**

27TH INTERNATIONAL CARTOGRAPHIC CONFERENCE

Rio de Janeiro, Brazil
 from 23-28 August
 For more information:
 E: christina@congrex.com.br
 W: www.icc2015.org

UAV-G CONFERENCE 2015

Toronto, CA, Canada
 from 30 August-02 September
 For more information:
 W: www.uav-g-2015.ca

► **SEPTEMBER**

PHOTOGRAMMETRIC WEEK 2015

Stuttgart, Germany
 from 7-11 September
 For more information:
 W: www.ifp.uni-stuttgart.de/phowo

INTERDRONE 2015

Las Vegas, NV, USA
 from 09-11 September
 For more information:
 W: www.interdrone.com

INTERGEO 2015

Stuttgart, Germany
 from 15-17 September
 For more information:
 W: www.intergeo.de

SUMMIT ON EARTH OBSERVATION BUSINESS (PART OF THE WORLD SATELLITE BUSINESS WEEK)

Paris, France
 from 17-18 September
 For more information:
 E: joly@euroconsult-ec.com
 W: www.satellite-business.com

CONVENTION OF SURVEYING "AGRIMENSURA 2015"

La Habana, Cuba
 from 23-26 September
 For more information:
 E: silvia@unaicc.co.cu
 W: www.agrimensuracuba.com

► **OCTOBER**

COMMERCIAL UAV EXPO

Las Vegas, NV, USA
 from 05-07 October
 For more information:
 E: lmurray@divcom.com
 W: www.expouav.com

INTERNATIONAL SYMPOSIUM OF DIGITAL EARTH 2015

Halifax, Nova Scotia, Canada
 from 06-10 October
 For more information:
 E: sponsorship@digitalearth2015.ca
 W: www.digitalearth2015.ca

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