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REPORTER 40



The Magazine of Leica Geosystems

Leica

MADE TO MEASURE

Ready for the new millennium



With this Reporter Issue No 40, Leica Geosystems opens up a new chapter in its company history. Because of the change of principal shareholder we have acquired a new capital basis which allows us to guarantee an even better service to our customers in the future. At the same time we are launching a new generation of total stations for demanding professional use and with a particularly attractive price: performance ratio.

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Leica

Leica Geosystems AG, CH-9435 Heerbrugg
President & CEO: Hans Hess

Editorial office

Leica Geosystems AG, CH-9435 Heerbrugg
Peter Bumbacher, VP Strategic Marketing
Fax: +41 71 727 46 89
Internet:
Peter.Bumbacher@email.leica-geosystems.com

Editors

Peter Bumbacher, Waltraud Strobl,
Fritz Staudacher (Stf)

Layout and production

Niklaus Frei

Translation

Dogrel AG, St. Margrethen

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Our way into the new millennium has therefore firm foundations and is clearly staked out for the future. Investcorp, London, our new principal shareholder, in a transaction worth 450 million Swiss francs, has taken over Leica Geosystems from Lancet Investments BV. The international management team based in Heerbrugg, Switzerland, as well as the workforce of a good 2200 employees remain unchanged. But by being quoted on the stock exchange, our strong position in the world-wide surveying market, with a market share of 20%, should in the medium term add a further dynamism to the future. For you as a Leica customer, this means that Leica Geosystems has, with this additional capital

basis, created for itself the means for new technologies, product developments and market initiatives as well as further extending its after-sales services.

In the financial year 1997/98 Leica Geosystems increased its sales by ten percent to 460 million Swiss francs and has positively continued this development in the current year in exactly the same way. Despite (or thanks to) our annual investments in research and development in the region of about fifty million Swiss francs, our profits rose in parallel with it. I am confident that this tendency will continue further. Why?

In this respect, look more closely with a specialist's critical eye at, for example, our new Leica Professional Series TPS1100 and the TPS300 Basic Series total stations. No other manufacturer on the world market offers you such a package of advantages.

As an example, the TPS1100 Professional Series: mass point recording with 50% gain in time, choice of five instrument versions of differing stages of automatic operation, four classes of accuracy between 1.5" and 5", full station operation and data transfer without connecting cable with the RCS1100 remote control unit, etc – and all this with the world's first total station with coaxial integrated distance measuring device without reflector. Please open this issue of the Reporter at pages 15 and 16 if you would like to know more about the Leica TPS1100 Professional Series and the TPS300 Basic Series.

We will keep our policy of expansion by concentrating on innovative total solutions which provide our customers with the decisive competitive advantage. I am pleased to invite you to join us on our path into the next millennium.

Sincerely yours

Hans Hess
President & CEO
Leica Geosystems



The brochure "Ready for the new millennium" provides you with a good overall view of Leica Geosystems, a copy may be obtained from your Leica Representative or by returning the order card enclosed.

Dear Reader



"Measure, record and monitor our environment, its infrastructure and resources" – what is embodied in Leica Geosystems' business aims as the area of activity, also moulds many of our readers in their professional activities. With the increasing integration of a multiplicity of qualitative data in position referenced GIS or LIS new responsibilities arise for many Leica Geosystems' customers, which they accept willingly. The experts in the Republic of Belarus have to concern themselves with one of the most serious cases of environmental documentation world-wide. You will also find in this issue of the Reporter an article on the technically demanding work of bridge building and tunnelling over and under the Øresund. The prevention of possible damage to nature project work must be taken into account when building. Time and again it is proved that without surveying engineers using the most modern equipment available for these tasks, such challenges cannot be mastered.

Yours,

Waltraud Strobl
Brand & Image Planning
Manager

Summary of contents

The land connection above and below the Øresund

In the year 2000 the permanent land link between Sweden and Denmark will become reality. We talk to those responsible for surveying this millennium work of construction.
Page 4



Modern land and environment register in Belorussia

One of the most modern land register of our times is being created in the middle of central Europe. A combination of photogrammetry, GPS, surveying and GIS enables speedy progress to be made with the project.
Page 8



Meeting place for surveyors

In the British coastal resort of Brighton, world-renowned specialists met for the 21st FIG Congress held under the motto "Developing the Profession in a Developing World".
Page 12



Hydrological studies in Greece

Interpretation on the basis of orthophotos offers numerous advantages. Dr Maria Lasaridou proves this impressively for hydrological tasks.
Page 11

A new generation of Leica Total Stations

With the Leica TPS300 Basic Series and TPS1100 Professional Series, Leica launches a new generation of total stations having numerous advantages.
Page 15

Permanent and fixed road and rail link across the Øresund

Europe grows ever closer together! This is not only a political process; large-scale infrastructure works are also helping to bring it about. Often, places that were once on the periphery are now turning into new economic centres. By the year 2000, Swedes and Norwegians will at last be able to get to continental Europe dry-footed, without a great detour by way of Finland and Russia or having to board ship. If they wish, they can even continue their journey as far as England and Scotland without getting their feet wet. The Viking long ships have had their day, and more difficult days for the ferries will come! A new permanent road and rail connection across the Øresund between Denmark and Sweden is at present under construction to make this possible. It will link the cities of Copenhagen and Malmö to make this the largest economic and trading region in Scandinavia, with more than three million inhabitants.



In the last couple of decades, two other major infrastructure projects have provided the conditions for this: the road and rail link across the Great Belt, between the continent and the Danish island of Zealand; and the "Chunnel", the Channel tunnel linking Britain and France. Only quite recently, in June 1998, the new 17-kilometre (10fi-mile) bridge and tunnel system across the Great Belt was opened to traffic. Earlier, French and British surveyors guided their tunnel-drilling teams during the construction of the 42-kilometre (25-mile) Eurotunnel through the limnic chalk under the English Channel. On the Øresund construction sites, as with the Chunnel and the Great Belt, Leica systems are again helping to provide precise coordinates and azimuths for the use of surveyors and construction teams.

Combined tunnel and bridge link across ten miles of stormy Baltic

The Øresund project will traverse the 16km width of the narrow sea between the Danish capital, Copenhagen and Malmö, Sweden's third-largest city, by a combined tunnel and bridge link. Near the island of Saltholm, landfill has been used to create a man-made island for the changeover from bridge to tunnel construc-

The Øresund project connects Copenhagen (on the right) to Malmö. This bird's-eye view shows how it will look on completion in the year 2000. Illustration by courtesy of Øresund BilledArkiv

tion. Thus the Øresund project, to some extent, mirrors the link across the Great Belt, but there, a natural island, Sprogø, was available for the bridge-to-tunnel transition, and the road was built progressively from west to east, largely separated from the railway line.

As they leave Denmark for Sweden, the four-lane road link and the pair of railway tracks dive underground immediately next to Copenhagen's Kastrup airport built on reclaimed land, into a 3750-metre tunnel under the Øresund. These two arteries then surface again on the west side of the 4210m long man-made island. For reasons of nature conservancy and because of ocean currents, the island is split east-to-west into two, connected by a 600m long bridge. From the island, a 3.1km shore span sweeps to the 1.1km high-level bridge across the Øresund – the project's biggest structure and Sweden's tallest, which, in the flat Baltic landscape, is visible from afar. The traveller will then continue the journey on the high-level bridge to the Scandinavian peninsula and by the 3.6km long eastern shore span to

the Malmö suburb Lernacken on the Swedish coast. The three Øresund bridges have a total length of 7480m. They are designed as two-level combined road and rail bridges, made up of 11m high by 120m and 140m long enclosed steel girder trusses. The two rail tracks are inside this structure. On top, once the 23.5m wide transversely prestressed concrete deck is cast, it will carry the four-lane road. The high-level bridge clears the sea to allow seagoing ships at a height of 57 metres to pass underneath by the Flinteren channel – moved sideways a little and dredged to a greater depth – through the shallows of the Øresund's needle's eye.

Some swan, that!

Like the western tunnel-building site in Copenhagen, the Malmö site is also a very busy place. The 100m tall neck of the Svanen (Swan) floating crane rises above Malmö North Harbour, flanked by the bridge's towering concrete piers and caissons cast here in the harbour. This Swan, with its 100m long by 70m wide pontoon,

is a member of a technical species in worldwide demand. It has already given proof of its 6700-ton lifting capacity and its accuracy on construction sites in other waters: first in the Great Belt, then in eastern Canada in the building of the great bridge on St Edwards Island. Long before Svanen floats out into the sea with its heavy load, the Sundlink surveying team had defined the positions of the bridge piers and pylons in the sea. Later, foundation pads have been secured with a height tolerance of $\pm 5\text{mm}$ in the underwater excavation. Then, with centimetre precision, the crane lowers the great pier caissons on to the pads. On the sea floor, underwater mortar is used to grout the caissons into place. Then Svanen can bring the made-to-measure pier shafts, varying in height, into the Øresund, where the caisson and shaft are joined together to form one of the fifty-one piers of the two shore spans. The bridge superstructure consists of forty-nine 120m and 140m long individual spans. These are prefabricated on land, floated out into position by the floating crane, and placed on the piers in perfect alignment. So are the trusses of the high-level bridge, weighing up to 5500 metric tons each. Only the two great caissons for the pylons were too much even for Svanen and had to be floated out on specially built catamaran barges hauled by five tugs.

Water above and below, that's the tough construction-site reality that people and instruments have to cope with.

Their position was determined by GPS in April 1997 with an accuracy of better than 75mm. Sliding shuttering is used for concreting the 203.5m tall pylons of the 490m clear-span cable-stayed bridge.

Self-contained surveying system for positioning

Besides its tremendous power and high-precision steering, Svanen owes its positional accuracy to the data it receives in real time from the Sundlink Surveying Section. Two years ago, Sundlink's chief surveyor, Uwe Krause, and a small team used the latest hardware and software to develop further a survey system of process-based procedures for the Swan's tasks. This provides all data

necessary for the precise navigation of the floating crane and the exact positioning of the structural elements in the Øresund. Three monitors continually display the position and any deviation from specified values. In the Øresund bridge project, Leica instruments are in use for all angle and distance measurement, with Leica APSWin software to monitor programmed settlement. These "water and field data" are collated at the central Surveying Section, transmitted electronically by Leica RCS1000 data terminals or radio link, and integrated as necessary in the higher-level GPS-supported database. This DKS network of six permanent Leica GPS stations in Denmark,

Sweden, and on the man-made island, transmits reference signals in RTCM SC104 format for GPS positioning in real time, and can be accessed with the RINEX format. It has a real-time accuracy over the whole of the project area of better than 30mm.

Steep sights on giant pylons

"Why are you only using Leica total stations and theodolites for your surveys on the Øresund?" we asked the Head of the Sundlink Surveying Section. Uwe Krause replied: "That decision was not spontaneous nor by chance. We arrived at it step by step as we began to look more closely at the criteria in the site specifications, and then it was practically a logical consequence. But first we had to reach a basic decision: what method should we use, GPS or conventional tacheometry, or perhaps a combination of both? For most tasks, GPS was out of the question, because it would not be able to ensure the accuracy needed in bridge-building. But we use GPS stations for checking and to obtain approximate navigational fixes. We therefore limited our choice of method to conventional surveying and its latest technologies. For us professionals it was clear from the beginning that the only instruments of practical use on the piers and the gigantic (over 200m tall) pylons must allow extremely steep mutual sights. Leica was really the only supplier of a practical, convincing and standard solution for that. Not only are there steep-angle eyepieces, pentaprisms, and other accessories available for these instruments, you can point at



very steep angles. All you need do is to hinge up the instrument's carrying handle."

Leica's man comes at once and gives reliable service

Besides accuracy and functional reliability, other aspects of these instruments that are nowhere more clearly visible and more decisive than on a major construction site are such factors as a uniform operating system and compatibility. And there is a special criterion: the supplier should be nearby, able to provide fast reaction times and quality service. Uwe Krause: "Our teams work shifts and must be reachable at all times, practically around the clock. A uniform operating system with programmable procedures of automatic target location, for example like that of the Leica TCA1800 total stations with APSWin software, reduces the job's complexity and increases the reliability of results. Our surveyors have to be out with the construction teams in all weathers; at first, at sea, they stand on floating cranes; then on scaffolding and platforms; and now ever more often at dizzying heights on mighty pylons and trusses. Malfunctions in instruments must be limited to the absolute minimum. And if, despite our own



At the moment, the high-level bridge emerges from the Øresund like a deep-sea oil-drilling rig. The shore spans of the bridge advance from the Swedish coast with a giant's steps.

section's careful maintenance and well-equipped calibration facilities, an instrument becomes unserviceable, we need the manufacturer's fast back-up. On a construction site like this, no-one can pay for or tolerate expensive downtime." Before the Sundlink survey team finally decided to use only Leica equipment, it gained on-site experience. Uwe Krause again: "Malmö isn't my first experience of Leica service. My first positive contact with this manufacturer's service and consultancy system was on my last construction job, the Athens

underground railway system. At the moment we have thirty-eight Leica survey instruments in use, mainly TCA1800 total stations, most of them equipped with radio modems for data transmission to Leica RCS1000 controllers. Some of our hundred or so prisms and many more reflector-foil targets are fixed permanently in position on particularly critical structural elements."

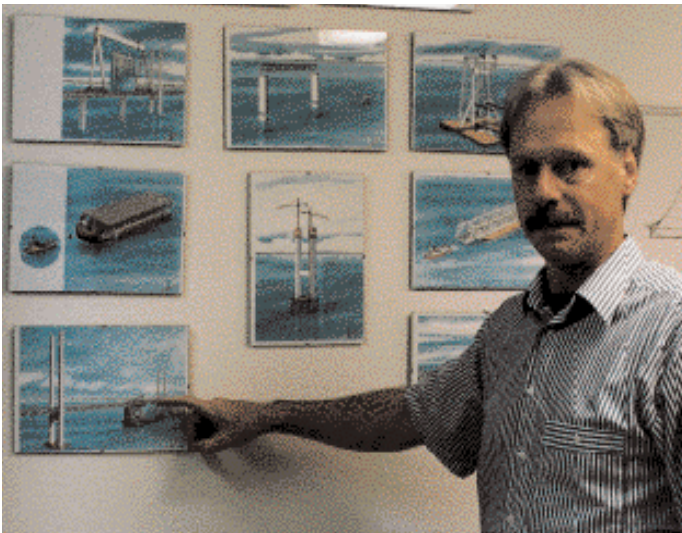
Project on schedule, only a single blip due to weather

So far, hardly any technical problems have arisen, despite the hard use to which the Leica equipment is exposed on the Øresund. Sundlink's survey team can rely on its instruments, just as Sundlink's entire project management can depend on Krause's survey plan and on his team of professionals. Although foul weather made it necessary to fix the position of the left-hand pylon caisson a second time in April 1997, the project as a whole is still on schedule. Thus nothing now seems to stand in the way of completion on time of this final link in Europe's direct north-south trunk-road and mainline railway systems.

The four pylon legs for the Øresund high-level bridge are still rising from the sea. Once the caissons had been grouted into place, a permanent geodetic network was set up with brackets firmly anchored in the concrete. The network was then surveyed by stationary GPS and checked from pylon to pylon with TCA1800 total stations. The coordinates of the control points were determined in the global DKS-GPS system by network adjustment.



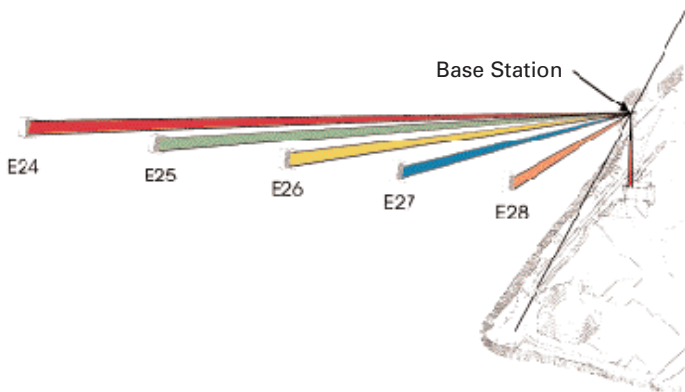
The next big European north-south project may well be a bridge across the Strait of Messina to link continental Italy with Sicily. That may start even before the proposed new Gotthard base tunnel through the Swiss Alps. It would be yet another challenge for bridge-builders and surveyors of Uwe Krause's calibre. The future will show whether the great Swan will also follow them to those gentler, more



In his office, Uwe Krause, Section Head Survey, explains the transport, assembly, and erection procedures for the bridge's various structural elements.

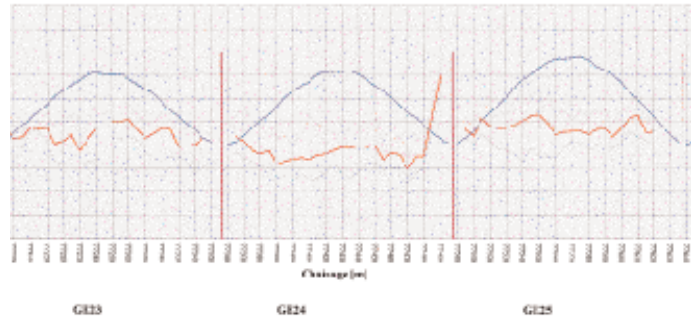
southerly climes. Meanwhile, Svanen is still very much in demand up there in the cold, salty, storm-tossed waters of the Øresund, the seaway that Øresundkonsortiet and Sundlink Contractors want to conquer in both directions as soon as possible, in the interest of all the people of Europe.

-Stf-



A certified Leica TCA1800 total station on a stable concrete pillar was used on piers E28-E24 to monitor settlement. The total station was connected to a computer and controlled by Leica APSWin software. Nearby controls in Lernacken were used as reference points for the measuring cycles each 15 minutes. Reflectors have been fixed to the upper sections of the pier shafts, one each on their north and south sides. Excel software is used for the further processing of data prepared by APSWin. All settlement has proved to be within the specified tolerances.

**Concrete Deck - Camber Phase 21
Survey June 1998**



Above: surveying results and optimizing correction values for the construction engineers are presented directly after the fixation of the bridge elements.

Sundlink's Survey Section, responsible to a consortium of four civil-engineering contractors

Sundlink's Survey Section is a department of Sundlink Contractors (Skanska, Hochtief, Hojgaard & Schultz, and Monberg & Thorsen), who won the design-and-build turnkey contract for the Øresund bridge, worth over a billion US dollars, when it was put out to tender by the Øresund Konsortiet. Uwe Krause, its chief surveyor, reports directly to Sundlink's Technical Department. In the framework of the consortium's decentralized management organization and within the limits of the specifications, he and his team carry out their job as an independent unit. Krause has organized his Surveying Section in four areas of responsibility. These main groups are Central Surveys, Onshore, Offshore, and Superstructure Surveys. At present, these teams run eight survey outstation offices to ensure around-the-clock accuracy directly on site. During the last two years, in step with increased construction activity, Krause's Sundlink survey team has grown to a total of 37 people. Despite the high degree of automation of their systems and procedures, the basic survey and a wide variety of planning, positioning, setting-out, and control duties keep them fully occupied on this vast construction site.

A land register of the future

In 1995 Belorussian surveying engineers set about creating a new land register for the Republic of Belarus with the help of Switzerland. Driving forces were mastering environmental problems, creating free-market conditions for providing the opportunity for personal and company development, the yearning for peace following decades of the cold war and Soviet domination as well as the will to do something positive for West-East economic equalisation.



In the "Land Registry and Land Management" committee of the FIG Congress 1998, consultant Jürg Kaufmann and Oleg Crupenin, deputy chairman of the Belorussian Committee for Land Resource received much approval and applause from international professional circles, on their presentation of the Belorussian Land Information System. In the 2500 km² large pilot district of Soligorsk the new owners could be presented with land certificates each with individual plan drawings after only 16 months and multifunctional documentation in various scales could be produced. That was only possible in such a short time because a highly qualified project management

team not only coordinated and applied a multiplicity of the most modern technologies and knowledge, but also because reciprocally, highly humane acceptance and specialist qualifications dominated. What exactly concerned the experts?

The responsibility of property

Quickly following the breaking away of the Republic of Belarus from the earlier USSR, the Council of Ministers had recognised that the path away from the centrally planned economy to the market economy required the creation of a legally enforceable right of property. A land reform with a comprehensive new survey and land

information database were therefore required.

Ground quality and contamination

Equally clear to those responsible, was that since the atomic power station accident at Chernobyl, lying merely thirty kilometres distant from the country's border, recording and mapping environmental damage had to be allotted a high degree of importance. Most of the contaminating substances from the Ukrainian atomic pile fell on Belorussia. And naturally the character of the soil and resources had to be classified. All this was only to be properly solved with the help of a modern information system.



Above: Jürg Kaufmann (left) in Minsk

Row of pictures right: (I) Project director Alexander Kovalyov, (II) Oleg Crupenin / SD3000, (III) GPS control point compressing, (IV) Assessment of ground: potash mining in Soligorsk.



Integrated data acquisition with photogrammetry, GPS and surveying

Based on a multifunctional land and environment register, as already used in the Swiss National Survey (AV93) a land information system specially adapted to meet the special requirements of Belorussia came into existence on the recommendation of Jürg Kaufmann under the project direction of V M Podolyako, A A Kovalyov and O M Crupenin. The latest surveying technologies of our decade and all from Leica were employed together: a RC30 camera system with ASCOT software for GPS navigation for the photogrammetry, two analytical SD3000 stereo plotting systems, a PATB GPS aero-triangulation software package, four digital DVP video plotting systems, a ATP2 stereo interpretation unit and a PUG4 point transmission unit, along with seven GPS System 300's for terrestrial determination of coordinates and three TC1010 total stations. Also with Swiss help, two Adalin GIS workstations and an aerial survey photograph scanner were acquired from other suppliers. In the second phase of the project a further six GPS SR9500's, four GPS SR9400's, thirteen TC800's, one PUG4, two ATP2's, two SD3000's and eleven DVP's all from Leica, were added to the list.

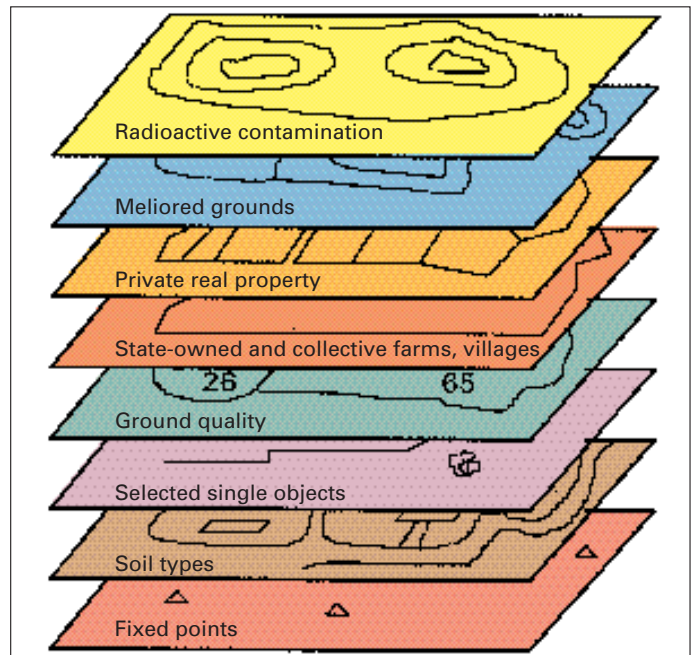


After only 16 months, plans with different scales and content could be created for the 2500 square kilometre large Soligorsk District from the LIS database.

Left hand page: Extract from the land register 1:1000 (here shown for printing reduced to 1:2000).
 Left: Reference map 1:25000 (here shown for printing reduced to 1:50000).

High reliability in two shift operation

120 Belorussian specialists acquired with this "equipment of high precision and reliability in two-shift operation" (J Kaufmann) the data in phase 1 in the field, from the air and in the office. Further specialists are being continuously trained on the spot at their own training and service centre in the application of these new technologies and in the maintenance of the instruments. The districts of Dscherschinsk, Minsk and Gorki in the meantime are also comprehensively documented, and with Soligorsk, will soon count with their land information as the most modern examples of their type worldwide. The conceptual and technical conditions for realising this land information system in the other Belorussian districts, and therefore to further development of the country, have been created.

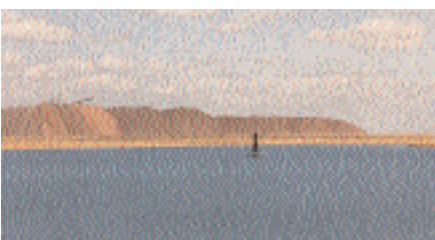


Structure and content of the Belorussian land information system

Ten work stages to the Belorussian LIS

1. Compressing the fixed point grid with GPS measuring
2. Photogrammetric aerial survey
3. Aerial triangulation control point determination
4. Determination of parcel boundaries with the future owners
5. Digitisation of the boundaries of state-owned and collective farms
6. Interpretation of individual objects and ground features from aerial photographs
7. Photogrammetric evaluation of visible parcel boundaries
8. Addition to the LIS contents with GPS / TC surveying
9. Integration of the ground quality assessments in the LIS by digitisation
10. Integration of the environmental information

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The REPORTER interviewed Dr. Alexander A. Kovalyov, the Director of the Science and Technology Centre for Remote Sensing RSTC "ECOMIR" at the Academy of Sciences in Minsk, Belarus.



Radiation investigation of contaminated territories by one of the mobile laboratories: Dr. Alexander A. Kovalyov, Director of ECOMIR (left) and scientists Olga Tereshina and Sergey Zuy.

What did the surveying situation look like in Belarus after an independent republic was created?

Alexander Kovalyov: "A new door opened. We suddenly had the opportunity to work with the most advanced technological concepts in the world. The main problem for the development of the country was the absence of a land-registration survey and of an ecology database. Remember that a lot of the fallout from Chernobyl finished up in our country."



How did you proceed?

"To start with, we assessed the requirements of our country, at the same time looking in the world markets for new partners who could provide us with the latest technologies for tackling our problems. We found these partners in Switzerland, and they met our requirements not only technologically but also governmentally and in terms of expertise in

"The best combination of technology and expertise"

surveying. Switzerland was the first country to give us not only moral support, but also to provide very substantial help in terms of credit. The embassy responsible for Poland and for Belarus, the Swiss Department for Overseas Trade (BAWI), and Mr Jürg Kaufmann, the Swiss consultant, brought in Swiss companies from the industry and created a realistic concept to be implemented in stages. Starting with our main goals, this concept combined aspects relating to property boundaries with those concerned with environmental protection and other subjects. When, in Soligorsk, we printed out each property owner's ground plan on our LIS and presented it, there were a lot of pleased faces. Foreign companies can now invest

here on the basis of this sort of data."

Belarus has strongly suffered after the Chernobyl disaster. How did your equipment work in the polluted territories?

"It's true that 70% of the radionuclides thrown out in the atmosphere by the Chernobyl accident fell out on the territory of the Republic of Belarus, resulting in a contamination with radionuclides of 22% of the Republic's territory. During the last five years, when proceeding with ecological and radiation investigation of contaminated territories, we have used mobile radiometric laboratories and Leica GPS and Leica TC600 total stations. All instruments worked very precisely and were reliable even in the most 'dirty' conditions."

What is the situation today?

"The first two pilot projects have been completed; Soligorsk is the better-known of the two. The results have proved to be completely in line with the requirements of our population, our government and our economy. Now we have to apply these methods and systems, and the experience we have gained, to five additional regions. We have set up our own service centre in Belarus for GPS and for total stations. We can intensify the training of our specialists in this area. In the name of all of those responsible in Belarus I want to express our thanks for the great support that you have given us. Without your help, we would not have made as much progress. The fact that many good friendships have been cemented between individuals in our respective countries is a typical by-product of our new European cooperation."

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Pre-conditions for the success of the project

Drainage and surveying engineer ETH Jürg Kaufmann is always being asked why this international land registry project went so well. These are his eight points:










- political support from the authorities in both countries
- an existing and clear legal basis
- good preparations and supervision for the project
- excellent technical concepts and equipment
- qualified specialists operating purposefully
- equipment working reliably in two-shift operation
- good communications (mutual understanding, translator)
- trust and (flowing from that) friendship

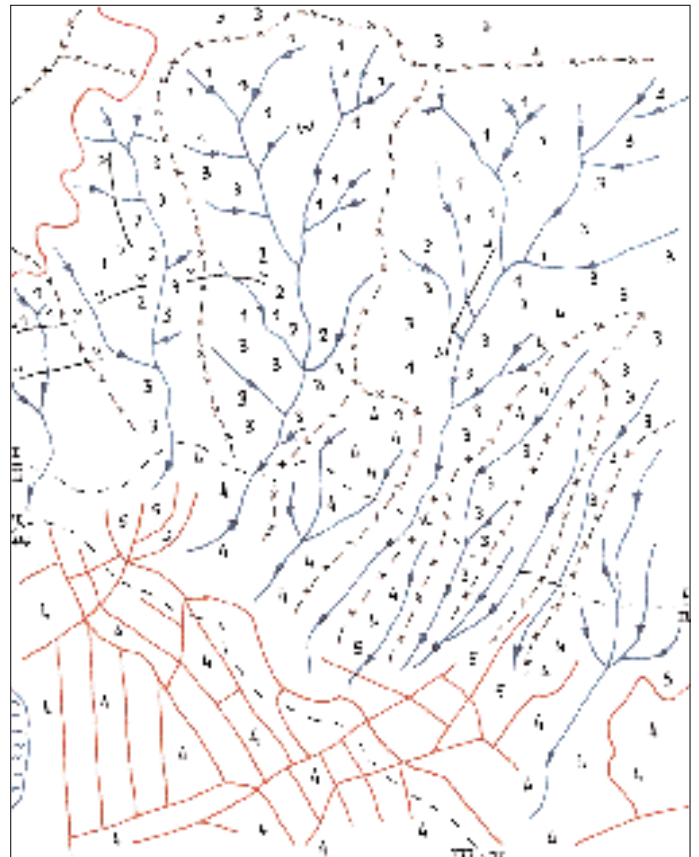
The art of photointerpretation

The word "technique", along with much basic knowledge in this field, has its origins in Greece. How one can gather and document with photogrammetric techniques and in particular by using orthophotography, hydraulic-hydrological conditions, was recently examined and described by Dr Maria Lasaridou of the Aristotle University Remote Sensing Laboratory in Thessaloniki in the study presented in the English and Greek languages "Contribution to the study of subjects of hydraulics by means of photo interpretation and photogrammetric methods".

The maps shown here are the results of orthophotographic interpretation under a Wild ST4 mirror stereoscope. In evaluating Maria Lasaridou was mainly concerned with the recording of drainage basins, watersheds, confluences, contours, isolated characteristic points, courses and land utilisation etc. In the study, Dr M Lasaridou came to the following conclusion: "A photointerpretation study is a valuable basis for all further examination (photogrammetry, digital analysis, GIS etc.). The steadily developing technique of orthophotography (elevation data, stereo orthophotographs, automatic operation etc.) proves itself to be a very interesting method because it offers a photographic document which combines the advantages of photography with a map. The orthophotograph was produced in an OR1 Wild Avioplan. The rectification measuring carried out in the Wild BC2 analytical stereo plotting instrument offers direct or indirect data for numerous important parameters for hydrological studies (land inclinations, numerous geometric data, acquiring a digital model of the terrain)".

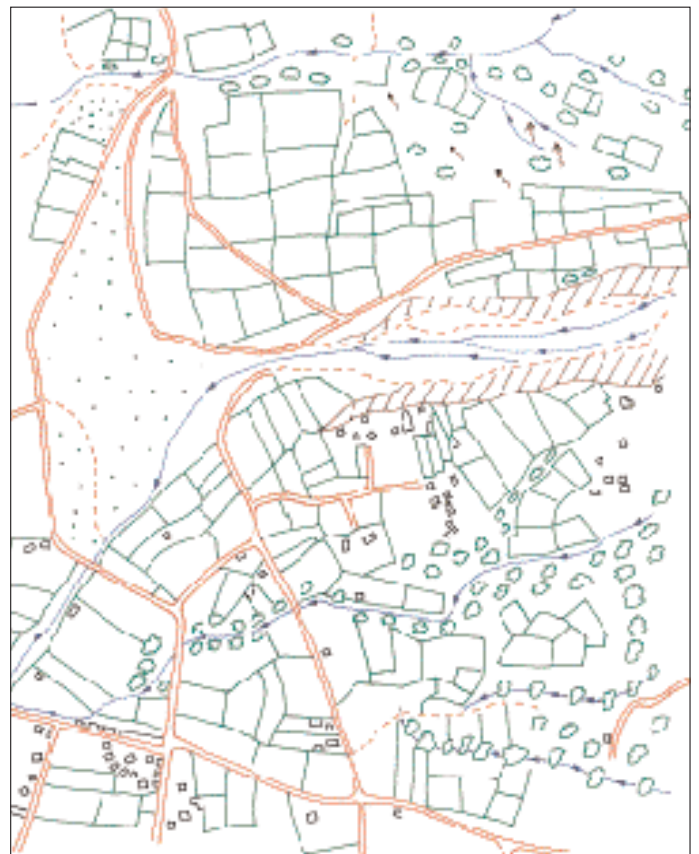
Right: Aerial photographic interpretation of a drainage basin (original scale 1:15000, reduced reproduction)

-  watershed
-  watercourse
-  road
-  old
- Area boundaries:**
-  (1) area of erosion,
-  (2) land slip,
-  (3) vegetation,
-  (4) cultivated land,
-  (5) built-up area.



Right: Orthophotographic interpretation (original scale 1:6000, reduced reproduction)

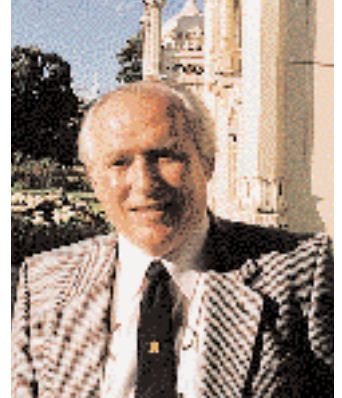
-  main road
-  secondary road
-  building
-  watercourse
-  cultivated land
-  tree
-  vegetation
-  steep slope
-  land slip



“People from 70 different nations but just a single theme”



Left: Cecilia Whitaker from MWD in South California, is within the 60-strong surveying department responsible for survey monitoring and documentation of one of the largest and most important water supply networks in the world. Among her responsibilities is also deformation monitoring of large dams in this arid area of active earth movements. Apart from the successful use of Leica TCA1800 total stations and Leica APSWin software, she looks at the basis of the Leica MC1000 for new approaches to finding permanent solutions in the field of GPS.



As does Mike Fort, senior lecturer at the National Construction College, Bircham Newton, Norfolk, numerous FIG Congress participants prepare a new generation for the profession of the surveyor, and also instruct civil engineers concerned with surveying.

It is almost impossible to find a better summing up of the meaning of the FIG Congress for the international exchange of experience in surveying, than this statement made by the American Cecilia Whitaker. In ten technical committees drawn from the 1200 participants of the Fédération Internationale des Géomètres (FIG) questions were discussed under the heading “Developing the Profession in a Developing World”. In almost 500 presentations, top-class speakers made it clear that the world of the surveyors is in upheaval and is positioning itself anew.

Father a surveyor, mother a surveyor: what indeed should the children want to become? Mark McDougall attends to all surveying tasks arising, from his surveyor’s office in Nelson Bug, Australia. In a syndicate with two other firms, in addition to classical Leica instruments, he also employs a Leica GPS300 and to his full satisfaction. Mark MacDougall: “After this FIG conference, it is more than ever before clear to me, that in the future, when working on a land register project, we shall include, integrate and manage much more than was the case previously. This opens up new opportunities for our branch”. And for his two children too!

Also belonging to Mike Fort’s research and training objectives is work with the Leica GPS System 300, which provides him with excellent results. Mike Fort: “It is mainly in the construction industry that GPS will gain in importance”.

The diversity in the new challenges was reflected in the choice of theme for the 21st International FIG Congress 1998 held in the British seaside resort of Brighton. They extend from computer assisted learning through land register reform of the OECD countries down to the integration of different positioning methods – a technical session presided over by Leica Geosystems’ Business Director, Holger Schade.

In the adjoining specialist exhibition, it was not instruments which occupied the foreground with Leica Geosystems but concrete solutions to problems learned from practice, as for example, surveying the Øresund land connection, constructing the new Hong Kong airport, building a new freeway in Orange County, California, or the photogrammetric documentation of Brighton’s Royal Pavilion.





Next to topics of further education, "New Public Management" was one of my main spheres of interest at this FIG Congress", said Dr Gert Steinkellner, secretary-general of the Austrian Society for Surveying and Geo-Information. As the person responsible at the Austrian Office for Weights and Measures and Surveying for training and further education of the 1500 people engaged at 60 locations, he could make a comparison at Brighton to see how other organisations are improving customer orientation and cost management. "As a result, the individual is thrust ever more to the centre. One of our main points of emphasis in further education is the continuing training with our instruments, software and computer applications. It is only in this way that these 'tools' can be used in a customer-friendly and cost efficient manner", said Gert Steinkellner. Amongst these 'tools' are numerous Leica instruments, and not only out of a sense of tradition.



Dr Yovanny Arturo Martinez from IGAC Bogota along with director Dr Santiago Borrero followed the workshops concerned with land registry, this time particularly more intensively. Yovanny Martinez is an assistant director land register at the Instituto Geografico Agustin Codazzi responsible for one of the most important projects of this type in the whole of Latin America and was himself the speaker on this topic at the ISPRS Congress in Vienna in 1996. The most modern instruments and systems are in use for new surveying, mapping and land documentation of this country, including GPS and LIS. They were all supplied by Leica Geosystems, which is also responsible for training the personnel.



Right: Marcel Müller of the cantonal Department of Surveying, Fribourg, particularly appreciated the technical excursions arranged by the British FIG specialists for their colleagues from the whole world. M Müller: "I took part in two excursions and saw impressive examples of modern surveying with Leica equipment. When for example does one otherwise have the chance to discover the secrets of London's water supply system?".



Above: Professor Jean Rüeger from Australia emphasised in discussions with Leica Geosystems Business Director Olaf Katowski, the necessity for passing on to students profound knowledge of instruments. Only in this way can the specialist recognise the limits of different methods and types of instruments, exploit advantages to the full and avoid mistakes.

Left: Thien-Nyen Wong, president of the Hong Kong Institute of Surveying, passed on professional insights from the planning and building phases of the Chek Lap Kok airport with numerous new road and rail accesses. Hundreds of Leica instruments were employed here.

Right: Professor Dr Fritz Brunner (left) from Graz University, is one of the pioneers of modern GPS surveying. Here at the Leica Geosystems stand, he is just discussing with Reporter editor Fritz Staudacher the ease of use of the new GPS equipment, a subject that Fritz Brunner had influenced on the industrial side, even at the beginning of the last decade.





You can read on the web site (www.leica-geosystems.com) what FIG participants were saying at the exhibition stand about their projects and experiences with Leica Geosystems and immediately find these statements again in the Internet. Thus reported the Australian Bernie deWitt about his experience with Leica Instruments: "We decided on Leica as far back as 1972 on account of the company's long tradition. Advisory and after-sales service are excellent and uncompromising as is the reliability of the instruments themselves. We have had practically all Leica products in action, from the earlier T2 with DI10, down to the modern GPS system".

Above: "The winners are..." FIG President Professor Peter Dale finds the lucky winners of the first Leica Geosystems Internet competition by the chance principle of drawing from the hat. John Aaron,

winner of the Leica R8 reflex camera and Chris Daniel winner of a Leica Disto were informed just two minutes later by e-mail from Leica Geosystems Internet Manager Miren Kauer.

Waltraud Strohl (in the centre of the picture), responsible for Leica Geosystems representation at the FIG Congress, thanks customers, visitors, organisers and the local Leica sales company in Milton Keynes, for their participation and support.



Left: Thus, also during the Congress, Malcolm Draper, journalist with an international surveying magazine, finds an agreeable way of obtaining information for his witty "Undercurrents" column for the "FIG Daily News" published each day.



Left: Large projects are pending in Russia. Of particular interest to Professor Sergej Say were the topics of land registry and GPS. In this, Europe's largest country, Leica Geosystems has a joint-venture production enterprise with Russian partners in Ekaterinburg, St Petersburg and Moscow.

Great performance at an affordable price

With its TPS300 Basic Series of total stations, Leica has established a new price/performance ratio benchmark. The rugged yet lightweight instruments are ideal for simple to sophisticated surveying assignments on construction sites. The focus in the development of these stations was on user-friendliness and efficiency gains. Many features – some exclusive to Leica, others unique in this price class – massively increase the user's productivity. They include reflectorless measurements, the laser plummet, an extra trigger, endless drive on the tangent screw and a fast electronic distance measurement hint.

The TPS300 Basic Series comprises two total station categories with or without built-in reflectorless measurement capabilities. Despite their extremely lightweight design these Leica instruments are robust and will easily withstand rough handling and exposure to inclement weather.

Ergonomics for productivity enhancement

Leica's development engineers placed great emphasis on user convenience. One example is the standard laser plummet which lets the surveyor set up and center the instrument much more quickly and with greater precision. The procedure is remarkably simple: on its tripod, the instrument is placed over the ground point and can then be centered with a clearly visible, intensity-adjustable laser beam. The endless drive on the tangent screw is another example: it eliminates the need to release and reclamp the instrument when more freedom is required.

A further detail which boosts productivity is the additional trigger which is ergonomically located next to the precision horizontal drive. Thanks to this feature, the surveyor can keep looking through the telescope while taking measurements – a very welcome convenience particularly when multiple measurements are involved!

The display and the alphanumeric data entry capability are also ergonomic assets: the TPS300 total stations incorporate best-of-class displays with 8 rows of 24 characters. At the same time, the predefined keys of the intuitive keyboard have the same function in every menu. This is appreciated particularly by users who do not work with the TPS300 every day. Additionally, the instruments come with built-in job management software for up to eight different assignments as well as on-screen prompts, a cost-effective feature for basic station configuration and set-up which prevents errors and eliminates the expensive repetition of measurements.

The endless drive and the laterally-situated trigger increase user convenience.



Reflectorless measurements: a debut in this class

The TCR models of the TPS300 Basic Series permit reflectorless measurement of distances and determination of points. Leica uses a visible laser beam with a very small diameter. The reflectorless measurement is not only fast and accurate but also offers considerable benefits in situations where access to the object is impeded or prevented altogether: building corners, high-rise structures, facade surveys or elevated objects. It is easy to switch between reflector and reflectorless measurement modes.

Full connectivity with the Leica system

The TPS300 Basic Series is fully compatible with Leica's Open Survey World Platform (OSW). Data interchange is handled by the Leica Survey Office software package, the

Leica TPS300 Basic Series: Designed for productive surveying on construction sites. The TPS300 Basic Series includes not only classical total stations, but also reflectorless total stations (TCR models) – a debut in this class!

shared platform for all of Leica's TPS sensors. The fast RS232 interface supports Geo Serial Interface commands and makes them downward-compatible with numerous GSI peripherals. It allows the user to upload data format templates from office systems to the total station and then to download the measurement records in the desired format.

-Stf-



The data managers

GEO 21/98en Wyss & Partner



TPS1100 Professional Series. Productive and economic. The new user-friendly Leica total stations supply goal-oriented data. The large liquid-crystal display shows all the main features at a glance. The well-structured control panel, with its coloured keys, turns the work into a dialogue between the user and the instrument. The flexible data-storage system easily adapts to your particular post-processing system. This is an investment with prospects. Contact your Leica agency so you can benefit from this innovation in your daily work. All at a price which, with so much performance, guarantees financial success.