New Developments in the Processing Software for P-Series Planicomp

Johannes Saile, Oberkochen

1. Introduction

The instruments of the Planicomp P-Series were presented to the public three years ago. The economy-priced P3 Planicomp has since become a standard instrument among analytical plotters, especially for jobs involving bulk data acquisition, i.e. in the fields of topographic mapping and DEM data acquisition. The top-of-the-line instrument P1 Planicomp is primarily used for applications where the special possibilities of optics switchover, optical interfacing and the large photocarriages are required, i.e. for triangulation measurements, terrestrial photogrammetry or if the connection of the VIDEOMAP stereo version would be of advantage. Both instruments feature the characteristic P-cursor for free-hand guidance of the floating mark and for command input. The P2 Planicomp, which was derived from the viewer of the C120 Planicomp and is therefore equipped with the traditional handwheels and foot disk, has also succeeded in holding its share of the market. Customers are now increasingly making use of the option to upgrade an existing C100 Planicomp to a P2 in order to be able to utilize the extensive capabilities of the PHOCUS program system. The three years since the market launch have shown that the three instruments with their different performance features effectively cover the users' requirements so that there has been no need for major changes or extensions of the hardware design. The flexibility of the instruments was also used to full advantage when it came to the connection of IBM-compatible computers featuring an MS-DOS operating system. The name P-CAP stands for the orientation software and the connection of CAD and GIS programs written for this computer category.

This paper deals with the capabilities and new features of PHOCUS and P-CAP, the emphasis being placed on object-oriented data acquisition and the measurement of digital terrain models.

2. PHOCUS

2.1 Object-oriented data acquisition in PHOCUS

MEOD (measure object data) is the central program for object-oriented data
acquisition in PHOCUS. The objects to be measured are entered in an object
code table, whose contents can be freely defined and therefore easily adapted
to a wide variety of requirements.

During measurement, the collected data are stored in a structured form in the
data base, but at the same time they can also be logged on several graphic
output units. The VIDEOMAP and StereoVIDEOMAP are valuable aids here for the
operator as they enable the direct comparison of the collected data with the
aerial photo. A special feature of the graphic display terminal is the possi-
bility of guiding the currently used display window along with the floating
mark movement. This ensures that the current section of the field of view is
always displayed, even with high magnifications.

The linking of elements to existing objects or object items is performed by
the SNAP functions. This way, the topological relations between the objects
are established and implemented in the data structure.

All editing functions are already available during data acquisition, permit-
ting the immediate correction of detected errors. In particular the functions
Snap, Delete last point/object etc., which are of special relevance for the
operator, ensure the acquistion of a data base where the necessity of subse-
quent editing has been substantially reduced.

The results of additional, geodetic measurements - e.g. roof projections,
completion of partly concealed objects etc. - can be integrated during or
after the measuring process on the instrument.

In the ongoing enhancement of this central measuring module of PHOCUS, we are incorporating user suggestions from their everyday practical work. Moreover, a programming interface enables each user to generate his own specific data acquisition functions. This means that the standard measuring program supplied with the equipment can be tailored to the customer's specific applications. PHOCUS thus meets the demand for an open-ended, flexible system.

For the acquisition of attribute data, the so-called object names and object item names are available at present. To meet the increasing demands that will be made in the future by photogrammetric users regarding the creation of geographic information systems, PHOCUS will be extended by the connection of a relational data base, permitting the definition and management of randomly structured attribute data. While the geometric data will continue to be stored in the PHOCUS data base, special data elements will be provided to form the connection with the relational data base.

2.2 PHOCUS PA Workstation

Customers have frequently expressed the wish to connect the analog stereo-plotters they are still using to the PHOCUS system, in order to be able to benefit from the advantages of object-oriented data acquisition also with the existing equipment.

The connection between the plotter and the PHOCUS computer is formed by the DIREC-P digitizing and interface unit. The inputs of the x, y, z encoders in the analog instrument are recorded and transformed by this unit and then transferred to the PHOCUS computer via a RS 232 standard interface. This ensures the connection to the different types of computers on which PHOCUS is implemented. Apart from the transformation of model into terrain coordinates, the software of the interface unit also performs the time-critical incremental recording procedures.

The absolute orientation of the stereomodel is supported within PHOCUS by an orientation program which computes the setting data for the orientation elements, while making allowance for the different types of terrain involved. If a model has already been oriented in Planicomp and stored in the stereomodel file, e.g. during a aerotriangulation measurement and adjustment process, this orientation data is used for the computation of the setting data. As a result, the speed of relative and absolute orientation of the stereomodel is considerably increased. After completion of the orientation process, the transformation parameters are transferred by a driver program to the digitizing and interface unit. The driver program also ensures that input data is correctly supplied to the internal PHOCUS interface. The data acquisition programs can therefore be used without modifications both in the Planicomp and the analog instrument.

The PHOCUS multi-workstation system permits the connection of several analog instruments to one computer, with the possibility of combining them with Planicomp, digitizing and editing stations.

2.3 PHOCUS DEM Measurement Program

2.3.1 MDTM

The standard measuring program for digital elevation models (MDTM) comprises the functions:

> Measurement of single points
>> Manual positioning of the floaing mark or
>> prepositioning using the input file, e.g.
>> for the determination of volumes

> Measurement of a regular grid
>> Prepositioning of the floating mark to a
>> selectable, regular grid

20

Measurement of parallel profiles
Guiding of the floating mark along defined profiles
with variable travel speed, use of various incre-
mental conditions for automatic point recording,
e.g. profile measurement for orthophoto production

Measurement of longitudinal and cross profiles
Guiding of the floating mark along longitudinal or
cross profiles defined by an input file. Use of
manual or automatic recording data, e.g. for measuring
terrain sections in road construction

These functions already cover most of the tasks arising in this field.

2.3.2 XSEC

The XSEC program (cross section) is a comprehensive package specially geared
to route surveying in road construction.

The sequence of axis elements consisting of lines, circular arcs or clothoids
is determined in a definition phase. The regular spacing of the stations can
be supplemented by randomly positioned intermediate stations, with the input
being performed either alphanumerically or by measurement. The length of the
cross profiles can be randomly defined. However, the definition of the route
may also be adopted from a different design program or read in via an inter-
face. During the measurement process, the floating mark is guided along the
longitudinal and cross profiles; the operator selects the movement speed,
sets the height and triggers the measurements. The measurement progress is
logged on the graphic display terminal. The route may extend over several
models. The measurement can be interrrupted at any time, and editing func-
tions permit the immediate correction of measuring errors. After completion
of all measurements, the data are output on an ASCII file and are available
for further processing. XSEC currently supports nine formats commonly used in
road construction today.

2.3.3 PROSA

The PROSA measuring program for digital elevation models was developed at the University of Munich and is also fully integrated into the PHOCUS environment. In line with the method of progressive sampling, a wide-meshed grid is first measured and is then locally densified depending on the terrain structure. The principal advantage of this approach is the reduction of the number of measuring points and, as a result, of the measuring time while retaining the desired degree of accuracy. The contour lines obtained by on-line computation can be displayed and assessed on the VIDEOMAP or Stereo-VIDEOMAP. The integration into PHOCUS also permits the use of other output instruments supported by PHOCUS such as graphic display terminals or plotters.

2.3.4 PROD

A further interesting program in the field of DEM is the PROD profile plotting program which permits the graphic representation of any type of terrain section. PROD enables the generation of a planimetric overview of all profiles. Each individual profile can be represented in vertical projection. The graphic output, including the desired lettering, is controlled by a wide range of parameters. If design data is available for the measured profiles, the cut and fill-up areas in road construction can be highlighted by selectable types of representation. The PROD program is a useful addition to the previously mentioned measuring programs.

3. P-CAP for P-Series Planicomp

3.1 Orientation and mapping

P-CAP is the overall name of the
- orientation software and the
- driver for the connection of commercial CAD and GIS systems
in IBM-compatible computers with a MS-DOS operating system.

The complete orientation software is implemented in the graphic user inter-
face WINDOWS from Microsoft. Standardized elements such as menu bars, pull-
down menus, list boxes and command buttons are used for calling up functions,
for the entry of parameters and the output of lists. The input is made either
with a mouse or the computer keyboard.

Apart from the known procedures for the orientation of a stereomodel, P-CAP
also offers functions for project and model management. In addition, a confi-
guration window enables the operator to assign the Planicomp input elements
(P-cursor, handwheels etc.) to the model movements in accordance with his
particular working habits.

After completion of the model orientation, an ASCII data file of a defined
format is generated for the orientation parameters (PHOREX format). This data
file is used as an interface for the driver if the CAD and GIS programs are
connected.

Opton Feintechnik has developed drivers for three of these systems, thus en-
suring that the Planicomp can be directly used as an input instrument. The
systems concerned are:

- AutoCAD from Autodesk
- MicroStation from Intergraph
- pcARC/INFO from ESRI.

Another five program systems have been connected to P-Series Planicomp by the
customers and program suppliers.

The direct use of Planicomp offers several major advantages:

- direct input of the terrain coordinates measured in the stereomodel,
  and therefore no need for conversion programs,

- all measuring and editing functions are directly available to the
  operator,

- the same system is used for data acquisition, editing and
  processing.

3.2 DEM measuring program within P-CAP

A special program has been developed for DEM measurement within P-CAP. It
offers a similar scope of functions as the PHOCUS measuring program MDTM and
includes for example:

- single point measurement
- grid measurement
- profile measurement with incremental recording

This PC version is characterized by a special feature. The area to be proc-
essed, which may extend over several models, is specified in the project de-
finition, with the boundary line being defined by a polygon of any size. The
same applies to the cut-out areas included (e.g. forests, builtup areas, wa-
ter surfaces). The total area to be measured is covered by a bit map, in
which each element represents the status of a measuring point, e.g.:

- point to be measured
- point not to be measured
- measured point
- point rejected by the operator as not being measurable

The bit map ensures that each point is checked during the measuring process.
As a result, the grid points and profile points of the cut-out areas are
skipped by the program from the outset and the measuring speed is increased.
Moreover, the bit map enables checks across the model boundaries so that
omissions or double measurements can be recognized and avoided right during
the measuring process. Interrupted measurements can be resumed at any time.
The graphic output of the bit map on the colour display terminal provides an
overview of the current processing status of a DEM project.

When all measurements of a project have been completed, the measured data is output directly in the data formats of the most important programs for further processing. These are the DEM programs SCOP and HIFI and the input format for the Z2 Orthocomp orthoprojector. An ASCII file with a flexible format is also available as an interface for further programs.

4. Summary

With the use of the P-Series Planicomp as a data acquisition instrument for
- digital mapping systems
- geographic information systems
- special photogrammetric measuring techniques

a large variety of programs hitherto unparalleled in analytical plotters has now become available. This range of powerful, application-oriented software is continuously improved and extended by Opton Feintechnik GmbH. The outstanding hardware of the P-Series Planicomp with P-processor is also ideally suited for the generation of special processing programs and drivers by our customers for existing plotting systems. These features guarantee that the versatility of the P-Series instruments will also continue to be enhanced in the future.

PHOTOGRAMMETRIC PRODUCTS FROM LEICA

A Stewart Walker

Leica Aarau AG
CH-5001 Aarau, Switzerland

ABSTRACT

The creation of Leica plc following a merger between Wild Leitz Holding AG and The Cambridge Instrument Company plc has major implications for the photogrammetric community. This paper summarises the events leading to this new company and outlines its objectives, philosophy and structure. Finally, a review is given of the photogrammetric product lines of the concern, emphasising developments which have taken place since the Congress in Kyoto.

1   INTRODUCTION

On 2 April 1990 the Leica Public Limited Company was formed. Registered in England, the new concern is managed from St Gallen in Switzerland. Its shares are traded on the London Stock Exchange. This powerful new concern will have a profound influence on the photogrammetric world and the purpose of this paper is threefold: to give an outline of the events which led to the formation of the new concern; to explain the objectives, philosophy and structure of the concern, so that readers understand clearly where and how the sales and support of photogrammetric products are organised; and to list the photogrammetric product lines and highlight developments which are fresh since the XVI International Congress of Photogrammetry in Kyoto in 1988.

Readers are familiar with the merger of Wild and Leitz which took place in the 1970s, culminating in the change of name to Wild Leitz. More crucial to photogrammetrists, however, was the assumption of a controlling interest in Kern and Co AG in 1988. Even as plans were implemented to merge the photogrammetric efforts of the Aarau and Heerbrugg factories, however, negotiations were afoot to form an even bigger and more influential group. Spurred by numerous commercial factors, including the requirements to trade successfully in the European Community and to have available the massive resources necessary to develop new products in the fiercely competitive, systems oriented world of precision optics, mechanics and electronics ("mechoptronics"), the concern has been created to take advantage of personnel, manufacturing facilities and sales organisations in a host of countries.

The Leica Public Limited Company, for which the term "Leica" will be used here, is eponymous with its product line associated with

top class photography. It aspires to attain the same leading status in numerous other areas of "mechoptronics".

Leica was formed on 2 April 1990 through the merger of the Cambridge Instrument Company plc and Wild Leitz Holding AG. Leica operates under British law, is registered in London and has its formal headquarters in Bar Hill, near Cambridge. There is a thorough Swiss influence, however, and the management of the concern in based in St Gallen near Zurich. Leica is 71% controlled by Unotec holding, which in turn belongs to the ANOVA Group of Dr Stefan Schmidheiny, one of the two remarkable brothers who control a formidable share of Swiss industry.

Leica is large. Its annual turnover is 1500 million Swiss francs and it has 11500 employees. It has technological and manufacturing centres in eight countries and sales and marketing subsidiaries in 23, plus representatives in many more. Famous companies and trademarks are grouped under one roof (Fig. 1). Photogrammetrists will remember, too, that Cambridge Instruments had brought with it to the merger expertise and product lines from earlier confluences with American Optical and Bausch and Lomb. Leica offers "state of the art" products of the highest quality, leads in key technologies and has earned large market shares in strategic segments. Its objective has been defined as being "the world's first choice provider of innovative solutions to customers' needs for vision, measurement and analysis".

Fig. 1   Famous trademarks within Leica plc

27

Leica construes its market as consisting of eight segments: biology and medicine; materials sciences; microelectronics; surveying; photogrammetry; industry; defence; photography. Its vast range of products falls into eight areas, which have some correspondence with the market segments: microscopes; scanning electron microscopes; microtomes and ultramicrotomes; surveying instruments; photogrammetric systems; optronics for industry; optronics for defence; photographic and projection equipment. Turnover can be assessed according to five major product groups: microscopes is largest, followed by surveying, which includes photogrammetry; photography and defence are smaller, only about half as large as surveying, with industry smaller still. It may also be analysed according to regions, with Europe accounting for 60%, America 28% and the Far East and Rest of the World 6% each.

CHIEF EXECUTIVE OFFICER — M. Rauh

Leica
Leica plc

Reporting to the Chief Executive Officer:

- **FINANCE & CONTROL** — R. B. Kalbag
- **INDUSTRY & SPECIAL PROD.** — T. J. Wicki
- **SURVEYING & PHOTOGRAMM. SYSTEMS** — H.R. Schwendener
- **MICROSCOPY & SCIENTIFIC INSTRUMENTS** — H. Wegener
- **EUROPE** — J. Meili
- **NORTH AMERICA** — B. Constantini
- **FAR EAST** — M. Hampson
- **LEICA CAMERA** — B. Frey

STAFF FUNCTIONS
- OPERATIONS — H. Wegener
- HUMAN RESOURCES — J. Roost
- BUSINESS & ORGANISATIONAL DEVELOPEMENT — T. Fawcett
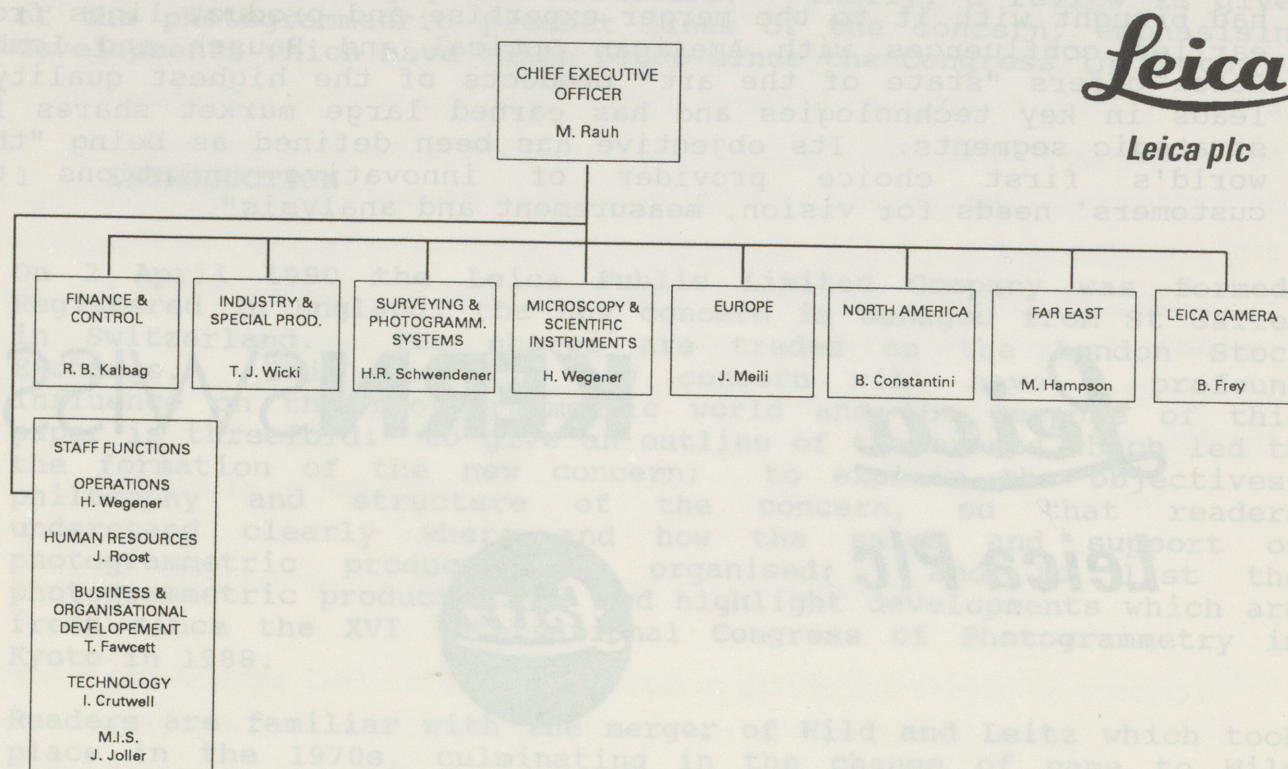- TECHNOLOGY — I. Crutwell
- M.I.S. — J. Joller

Fig. 2   The structure of Leica plc

Fig. 2 shows the structure of Leica. To permit a proper understanding of the activities and products within Leica which are relevant to photogrammetrists, however, some clear explanation is required. The Industry and Special Products division, which is represented in many locations, including Aarau and Heerbrugg, supplies both products and components to a wide range of organisations. Amongst the products sold to industry, for example, are prisms for scanners and the Wild range of plotters, such as TA10, TA30, TA40, TA41 and laser raster plotter. Defence products include not only sights and rangefinders but also high
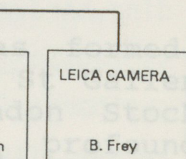
powered devices for viewing imagery, which will be discussed further in section 3.1 below. Also, for historical reasons, the aerial cameras and other photogrammetric products manufactured by Leica Heerbrugg AG, formerly Wild Heerbrugg AG then Wild Leitz AG, fall within this division.

The Surveying and Photogrammetry Systems division is best known for its impressive range of total stations, theodolites, levels and accessories. These are manufactured mainly in Heerbrugg and Singapore. The Aarau part of this division is central to this paper. It includes photogrammetry, land information systems and industrial measurement systems, which are complete systems, as distinct from the special components made by the Industry and Special Products division.

The Microscopy and Scientific Instruments Division is of much less interest to readers of this paper. The Leica Camera division, based in Solms, West Germany, is of some interest with respect to close range applications (see 3.4 below).

2   LEICA AARAU AG

The bulk of Leica's photogrammetric operations are carried out by Leica Aarau AG, formerly Kern & Co AG, and referred to in this paper as Leica Aarau. Leica Aarau has around 500 employees. The composition of its turnover differs from that of Leica plc in several respects.

"Surveying" consists mainly of photogrammetry, land information systems and industrial measurement systems: geodesy instruments now represent less than 10% of turnover in Aarau and will be phased out by the end of 1993, although a service facility has been retained. Surveying accounts for more than one third of turnover in Aarau, defence products a similar proportion and products for industry, therefore, much less. The microscope and photography areas are not represented. Leica Aarau has higher turnover, proportionately, in Europe and much higher in the Far East than Leica plc.

As turnover from geodesy ceases, overall expansion is planned for Aarau, mainly from surveying and industry, with rather less from defence. Leica Aarau expects to be a major participant in the "mechoptronics" market with industrial measurement systems, sensor systems and stereometric systems and in the land surveying market with photogrammetric systems and land information systems. The future is seen to be the system business, based on sales of spatial sensors, key components manufactured in-house, software, system integration and customer training. The unique atmosphere of Aarau, blending 171 years of excellence in optics and mechanics since Jakob Kern began manufacturing his drawing instruments with modern facilities for research, development, manufacture, integration, marketing, sales and support of the latest "high tech" systems, all in a wonderful Swiss environment, will be exploited not only to attract and welcome current and potential customers but also to seek staff of the highest quality.

The photogrammetric products are most informatively covered according to location of manufacture. As has been explained above, products from Leica Aarau fall within the Surveying and Photogrammetry Systems division, whereas those from Heerbrugg fall within Industry and Special Products.

3.1   Leica Aarau AG

The main product ranges from Aarau are well known. Note that existing products will retain "Kern" and "Wild" in their product names. The Wild BC3 analytical stereoplotter is attracting high levels of sales. It is a versatile and productive instrument with modern, friendly mapping software running under the Unix operating system on Compaq or Data General computers. Users report high productivity in both mapping and close range applications. Upgrade kits are available to bring AC1s, BC1s and BC2s up to BC3 level. The recent launch of RISIS, Raster Image Superimposition System, in both mono and stereo versions, enables users of BC3s and upgraded BC1s and BC2s to check for completeness and accuracy of new mapping, map revision, digital terrain models, industrial measurement, etc.

The Kern DSR14 and DSR15 lines are also well known and successful. The DSR14 is the "workhorse" for mapping applications, appealing to users of the MS-DOS operating system on personal computers. A strong interface, PC-PRO 600, to Intergraph's powerful MicroStation CAD software provides customers with a superb environment for data collection, editing and presentation. The Polytel touch sensitive keyport simplifies the user interface. A new release of the DSR14 software at the end of 1990 will strengthen the appeal of this instrument. The DSR15 is the top of the line, offering a wide variety of options, such as CCD cameras or KRISS (Kern Raster Image Superimposition System). The DSR15 runs under VMS on Digital MicroVAX and VAXstation computers. Customers can upgrade their DSR1, DSR11 and DSR12 instruments to DSR14 or DSR15 as required. The DSR15-18 is also available, with double size stage plates for accommodating either LFC imagery or two simultaneous pairs of 23 x 23 cm photographs for comparative measurements in fields like glaciology.

A new development offered to DSR15 customers is MAPIT. This is a streamlined version of Kern INFOCAM, the established land information system from Leica Aarau. MAPIT is designed for photogrammetric data collection, editing and presentation and incorporates sufficient modules of INFOCAM to provide these functions in a friendly but powerful way (Fig. 3). MAPIT operates in conjunction with KRISS, on which the menus appear, so that the photogrammetric operator can make selections without looking away from his oculars. MAPIT incorporates a topology builder with an inconsistency check. Thus the operator not only collects complete and accurate data, verifiable by KRISS, but he forwards clean, consistent data to the next stage of the process. The IMPRESS module, which is part of MAPIT and is an option available to INFOCAM customers, is new and includes powerful interactive facilities for designing plots, which can be directed to Kern GP1,
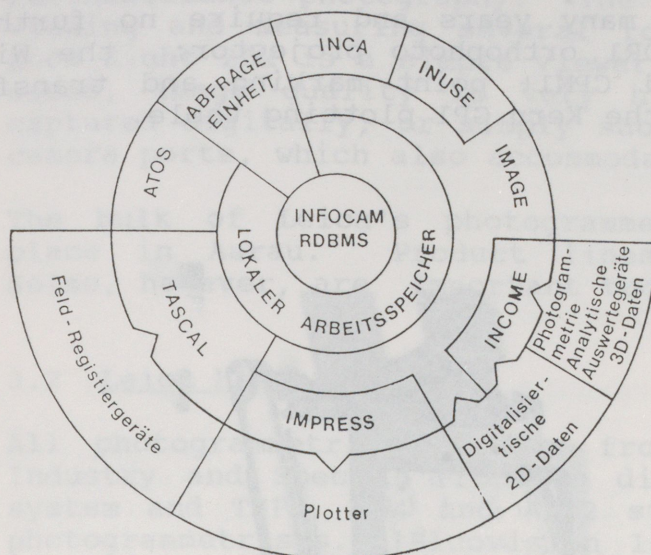
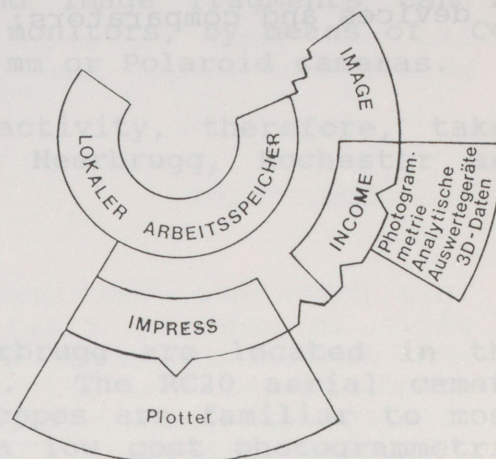**INFOCAM**   **MAPIT**

Fig. 3   MAPIT as a subset of Kern INFOCAM

Wild TA2/TA10 or numerous drum plotters. Naturally, the MAPIT
customer has the option of upgrading to a full INFOCAM package,
including the ORACLE relational database management system.

The Wild S9-AP is the photogrammetric workstation of the System 9
geographical information system. Thus it is no longer sold as a
Leica product but is manufactured in Aarau to meet orders from
Prime Computer Inc.

The Kern DSP1 digital stereoplotter has been widely reported
elsewhere. Various minor improvements have been made, the most
visible being new furniture to match DSR14/15 and the option of
handwheels (Fig. 4), to suit operators for whom data acquisition
by track ball is not the natural choice.

In addition to its own software and a range of familiar packages
for block adjustment - BINGO, BLUH, PAT-B, PAT-M, in various
versions for various computers - Leica Aarau offers certain third
party software products to enhance photogrammetrists' work.
Intergraph MicroStation has been mentioned above. A second
example is SCOP, the package for digital terrain modelling from
the Technical University of Vienna. Also well known and
successful is LITES2 from Laser-Scan Ltd of England. Leica have
sold several Laser-Scan systems for editing and digital mapping,
but it is worth mentioning the online interface between the DSR15
with KRISS and LITES2. Again this displays menus to the operator
through the oculars, so maximising productivity, with menu
selection accomplished by using the DSR hand controller like a
mouse. The LITES2 environment can be extensively customised to

31

suit the project in hand. This DSR15/KRISS-LITES2 interface has been very well received by Ordnance Survey in England, the bulk of whose work is now map revision rather than new mapping.

This product range is completed by a number of instruments which have been on the market for many years and require no further description here: the Wild OR1 orthophoto projector; the Wild PUG5 and Kern PMG2, CPM1 and CPM1+ point marking and transfer devices and comparators; and the Kern GP1 plotting table.

Fig. 4   Kern DSP1 digital stereoplotter

Also manufactured in Aarau, as explained in sections 1 and 2 above, are the ECDS and SPACE systems for industrial measurement. ECDS makes use of industrial versions of the E2 electronic theodolite, whereas SPACE uses a version in which the telescope is replaced by a CCD array. Whether these systems are photogrammetric is a nice point for debate, but SPACE has certainly been described by some workers as a system for close range photogrammetry. Special measurement systems are also manufactured to order, some of which use CCD cameras and bundle adjustment but fall within the purview of ISPRS Commission V.

32

The suite of products from Aarau is completed by three devices from the Industry and Special Products division. The RK820 stereoscope has optics of the highest quality and offers a magnification of up to 285x for detailed examination of metric and reconnaissance photography. The SMI2 stereoscope is designed for viewing and measuring several rolls of 70 mm film, whereas the Zoom Sight 20x is a simple viewer for single images. In all three cases, image quality is very high and image fragments can be captured digitally, or simply shown on monitors, by means of CCD camera ports, which also accommodate 35 mm or Polaroid cameras.

The bulk of Leica's photogrammetric activity, therefore, takes place in Aarau. Product lines from Heerbrugg, Rochester and Solms, however, are important too.

3.2 Leica Heerbrugg AG

All photogrammetric products from Heerbrugg are located in the Industry and Special Products division. The RC20 aerial camera system and TSP1, ST4 and APT2 stereoscopes are familiar to most photogrammetrists. Elcovision 10 is a low cost photogrammetric measuring system based on the Leica R5 camera (see 3.4 below), enlarged paper prints, digitising tablet, Wild software and the AutoCAD package. Finally, a tiny proportion of the Wild plotters is sold for use in photogrammetry, primarily TA10s and TA30s.

3.3 Image Interpretation Systems, Inc.

The manufacturing unit of Cambridge Instruments located in Rochester, New York, is now known as Image Interpretation Systems, Inc. The products are well established and popular. Zoom 95, Zoom 240 and Zoom 500 stereoscopes have sold in large numbers for many years. The ZT-4, ZT4-H and Stereo Zoom Transfer Scopes are used in numerous mapping organisations throughout the world to transfer photographic information graphically on to maps. The ZTS/VM is a Stereo ZTS with the VM Vertical Measurement Module for calculating XYZ ground coordinates rigorously. The newest product is the GIS/VM, which omits the map superimposition and optics for anamorphic geometry from the ZTS/VM, leaving an economical instrument designed for data acquisition for input to GIS systems with straightforward operating procedures (Fig. 5).
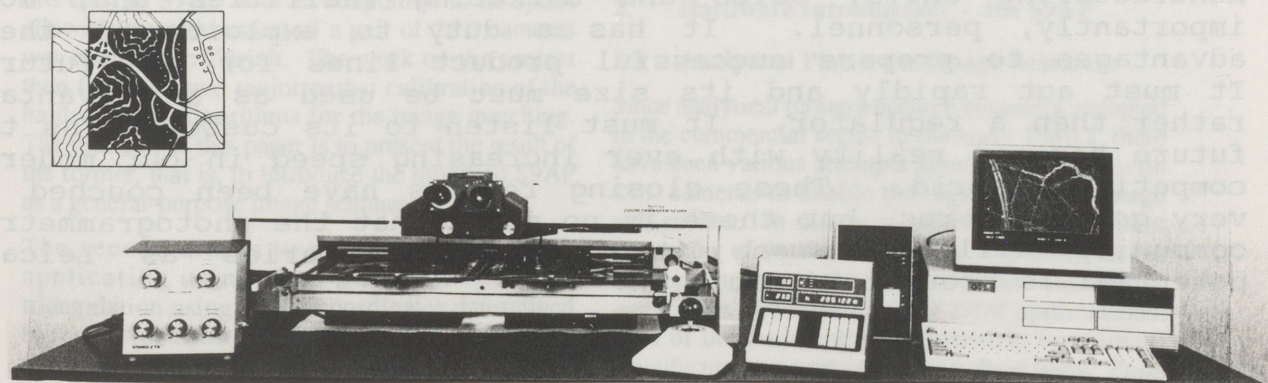

Fig. 5   GIS/VM from Image Interpretation Systems

3.4 Leica GmbH

Leica GmbH in Solms is part of the Camera division of Leica. It produces one product of interest to photogrammetrists, the R5 35 mm camera with reseau. Good results are obtained if the camera is properly used in conjunction with its calibration certificate. The R5 is sold not only as part of Elcovision 10 (see 3.2 above), but on its own as a data acquisition device for close range photogrammetry, where the convenience and reliability have led to its use even in architectural photogrammetry, traditionally a preserve of larger format cameras.

4   CONCLUSION

This paper has described the formation and organisation of Leica plc. In order to clarify how and where photogrammetric products are manufactured and managed, it has outlined the divisional structure and some of the manufacturing facilities of the concern. Finally, the photogrammetric products themselves have been listed, with brief information added on recent developments.

Leica is a major multinational organisation with the potential to dominate certain market segments where its high quality "mechoptronics" products are in great demand. In Aarau it is blessed with an outstandingly attractive venue on which to centre its photogrammetric activities, supported by further product ranges from Heerbrugg, Rochester and Solms.

It is clear that Leica must rationalise a number of overlapping product ranges and facilities. But customers can relax in the knowledge that their investments will be fully protected because Leica, as a result not only of Swiss law but also of its approach to and respect for its customers, guarantees to support both hardware and software for many years to come. Furthermore, minor improvements in organisation and structure will doubtless take place, although the major strategic decisions have already been made. During these formatory stages, Leica must ensure that its customers are kept fully informed: this paper is one of many documents prepared with such an objective.

This careful evolution must be echoed by a concern for the future. Leica has enormous potential in terms of customer base, manufacturing units, sales and marketing facilities and, most importantly, personnel. It has a duty to exploit all these advantages to prepare successful product lines for the future. It must act rapidly and its size must be used as an advantage rather than a regulator. It must listen to its customers as the future becomes reality with ever increasing speed in our modern, competitive world. These closing remarks have been couched in very general terms, but there is no doubt that the photogrammetric community will be among the main beneficiaries as Leica's potential is brought to fruition.