

## METRIC DOCUMENTATION AVAILABLE ON HERITAGE

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### ABSTRACT:

The putting up of a new departement of topography and photogrammetry belonging to the Ministry of the Region of Wallonia in charge of the Walloon heritage has given us the opportunity to use modern methods of spatial surveys since 1991.

The region of Wallonia is located at the north of France, between Germany at the East and the Regions of Brussels and Flanders at the North and West, sides of Belgium that is at the very crossroad of major historical events in West Europe.

There are only 265 km between the two most distant towns of Wallonia but it counts some 2667 monuments, 1155 sites and 27 architectural complexes. There are also about 40 permanently opened archaeological sites .

The departement of monuments and sites is particularly concerned about constituting an extensive and reliable documentation on major monuments. Indeed the mission of the departement of topography and photogrammetry is the constitution of the metric documentation of that heritage as well as to answer to short-term problems. This departement is in fact a very good laboratory of study of the efficiency of modern measurements techniques due to the diversity of the monuments located in this relatively small territory.

Terrestrial , aerial and underground surveys are regularly done.

Infrared and laser numerical topography are often used in the radiate method. Terrestrial, zenithal, vertical and horizontal stereophotogrammetry as well as aerial photogrammetry are done with the same semi-metric camera (6x 6 format).

The direct operation of a part of the shots is done on analytical 6x6 format equipment.

Instruments : Topography : Geodimetre 422 - Leica T460D and Disto. Photogrammetry : Rollei metric 6008 focal 40 and 120 mm - MPS2 of Adam and 3DD software - Aerial navigation assisted by Sony Digital DCR-VX 700E camera and GPS system.

Examples of missions: plan and deformation measurement of the structure of a gothic choir in a cathedral. 3 dimensional digitalization of a neolithic skeleton ( 4500 BP) that has been found in a winding shaft of a flint mine - 1/20 scale map of a dolmen, equidistance of contour lines : 5cm - Aerial photographs of major heritage photogrammetric archives : a company specialized in the information on new technologies based on an archeological industrial site is using 2 photographs for its promotion on internet site web at address <http://www.cta.be> at last page in "info utile".

The needs in metric documentation about monuments are important.

Metric documentation, along with other types of documents, allows the Walloon historian to trace back the evolution and history of a monument. Also, metric documentation allows the archaeologist to understand the very process of his own investigation on the field and to understand the history and function of his study matter.

Topographic and photogrammetric works are asked for by the heads of the Department of Heritage or by local archaeological and historical societies subsidized by the Department. Although the Department had at the beginning a complete station and softwares for drawings assisted by a computer, its only from 1994 that the Department has been equipped with a photogrammetry stereorestituting system. However, the Department had acquired in 1992 a semi-metric camera

Leica R5 (format 24x36). The aim was to archive metric images of monuments or archaeological sites in order to be able to reconstitute in a undetermined lapse of time after, these images in photogrammetric exploitation system with a precision degree that seemed sufficient at that time.

It was thought that Elcovision system and a DVP station could be bought then.

However the temporary loan of a semi-metric camera Hasselblad and the more demanding requests on behalf of our Department (as far as the complexity of subjects was concerned) has made us reorient our policy in acquiring metric data.

The 6x6 basic format was chosen basing that choice on the former experience of the Ministry of Public Works that had used that format in the 80's for his close-range photogrammetric surveys.

The Hasselblad semi-metric camera had be chosen for the easiness of taking shots, the image definition, and its perfect compatibility with analytical restituting systems that were becoming more and more popular that time.

The 30 years experience in aerial and terrestrial photogrammetry acquired by the Ministry of Public Works has been passed down to the Region Departments when the national ministries have been split between the Regions of Belgium.

The main mission of the service for topography and photogrammetry of the Department of Walloon Heritage is to answer as quickly as possible to the practical problems encountered by the archaeologist, the historian or the architect about the dimensions, spatial disposition and geographical location of a monument or a site on which he is working on.

The great variety of monuments to be measured and the final destination of the measurements campaigns imply for each request, a dialogue between the commissioner and the service. The precision, the configuration of output data and the territorial limits of the survey have to be debated. This avoid waisting time while on the field. The chosen methodology must correspond to the demand in precision as well as in the survey quality.

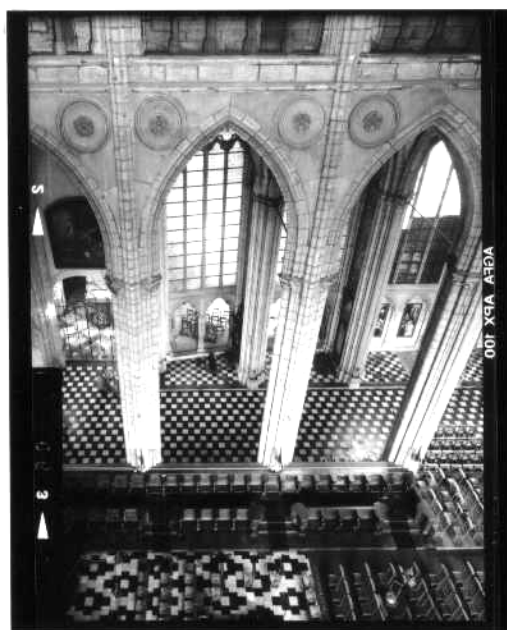
A part of these surveys are completed by the commissioners themselves with the help of details in their possession, what renders interpretation immediately readable for the aimed purposes.

To fulfill its tasks, the service can count on the help of technicians based in provincial centers. They have received an adequate formation to be able to use topography material.

Stereophotogrammetry is sometimes used for archaeological purposes. For example: Restitution of a dolmen at 1/20 with contour lines separated by 5cm and restitution of a neolithic skeleton (4500 BP) at 1/10 that has been found in a winding shaft of a flint mine. The operations have been conducted in emergency just before disassembling the skeleton.

As far as architectural heritage is concerned, the restitution of facade plans is only done occasionally up to now.

In the future, a precise survey for all important restoration projects will be asked, due to the adoption of a new legal relementation. Of course, this will increase the use of photogrammetry for architectural purposes. The Department is already proceeding to the plotting of characteristic points and is taking metric photographs of monuments under study. If these photographs are not always immediately exploited, they are constituting a starting point for a metric archive of the Walloon heritage.



Tournai : Gothic choir in the cathedral. Measurements of structure deformations and photogrammetric archiving (Wild P32).

A vertical aerial photogrammetric documentation is added to the terrestrial one for the same sites when needed. In other cases, the vertical aerial photogrammetry is used alone for financial reasons.

Example: Restitution on MPS2 by ADAM at 1/250 of the ruins of the Castle of La Roche en Ardennes. The shots are taken with the same camera as the one used for terrestrial views (Rollei metric 6008 format 6x6 cm).

The camera is attached to a small metal frame which is itself fixed on to the airplane floor ( Cessna 172 ).

The scales of the photographs range from 1/2500 to 1/33000. In order to have a good vertical flight, the navigation is assisted by GPS ( navigation precision) and by the ground image in real time on a video monitor fixed to the airplan's floor. This monitor is visible by the pilot and the operator. The image is sent to the monitor by a camera Sony Digital DCR-VX 700E which is mounted with a frontward panoramic angle on another metal frame which is placed in the second hole of the airplane's floor.

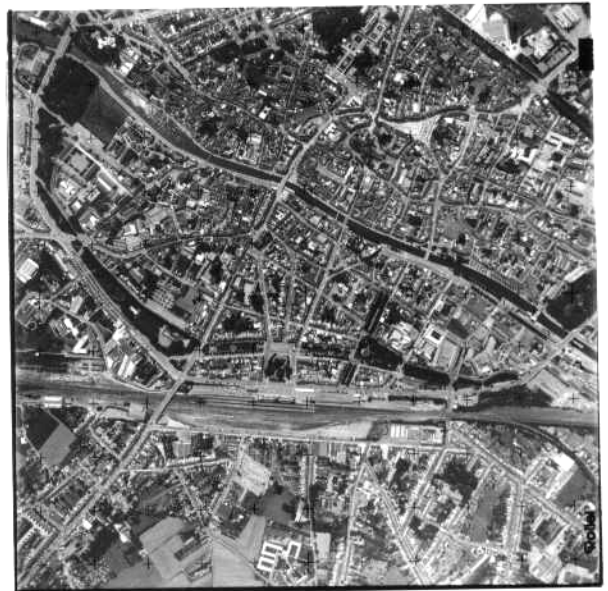
A flight scheme is planned for each site and the operator presses down the shutter release in a time lapse calculated in order to obtain a 55 to 60° overlap between each photograph.

Of course, this aerial work will be covered by conventional mapping camera (23x23cm) but for the middle and small geographical aeras the 6x6cm format is very economical

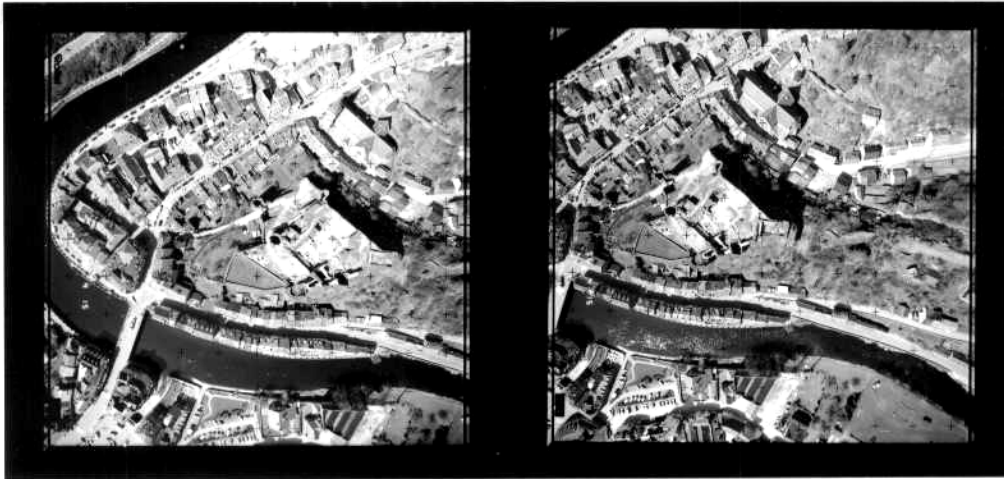
When necessary , the mapping restitution by stereoscopic pairs is done on a stereorestitutor with 6x6cm format MPS2 of Adam. The analysis is assisted by a 3DD Hitech Mapping Software.



Tournai : The cathedral. Rollei metric 6008  
Altitude 310m - scale 1/7000.



Tournai : The city. Rollei metric 6008  
Altitude 1350 m - scale 1/33000.



Castel of La Roche en Ardennes : The time lapse calculated in order to obtain 55 to 60 % overlap (Rollei Metric 6008).

