

THE PHOTOGRAMMETRIC ACTIVITY IN ITALY FROM JANUARY 1st 1964 TO DECEMBER 31st 1967

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At the beginning of 1968 a questionnaire was distributed to the public and private photogrammetric Organizations and to the photogrammetrists working in Italy, with the aim of collecting information for the drawing up of the present report.

The questionnaire, which is related here below and to which the summarized description that follows will refer, has been drawn up according to point 10 (National Reports) of the «Directives pour les travaux des Commissions et les publications valables jusqu'au Congrès 1968» given by I.S.P.

- 1 - *The nature and the extent of the photogrammetric activity with industrial productive character.*
 - 1.1 Taking operations
 - 1.2 Net of the ground control points
 - 1.3 Plotting operations
 - 1.4 Photo-interpretation
 - 1.5 Special applications
- 2 - *The new methods, new equipments and aims worked out and tested in the production field.*
 - 2.1 Innovations in the methods and in the instruments
 - 2.2 Original and new aims
- 3 - *Contribution of Photogrammetry in solving problems of economic politics.*
 - 3.1 Use of Photogrammetry in economic problems, particularly during the late alluvions
 - 3.2 Advantages deriving from the use of Photogrammetry also for problems connected with town planning
- 4 - *Researches of scientific and technical character.*
 - 4.1 Researches and experiments on the instruments
 - 4.2 Researches and experiments concerning the operations
- 5 - *Progress of the photogrammetric technique.*
 - 5.1 In the instruments
 - 5.2 In the methods
 - 5.3 In the computations
 - 5.4 In the applications

The Organizations mentioned here below answered our questions with full particulars:

State Organizations

Istituto Geografico Militare - Firenze

Istituto Idrografico della Marina - Genova

Direzione Generale del Catasto e dei SS.TT.EE. - Roma

University Institutes

Institute of Geodesy, Topography and Photogrammetry « G. Cassinis », Politecnico, Milano
Institute of Topography, Politecnico, Torino
Institute of Geology, Palaeontology and Geography, Università, Parma
Institute of Topography, Università, Cagliari
Institute of Architecture, Università, Bari
Institute of Physics, Università, Milano

Private Photogrammetric Organizations

AERFOTO - Parma
E.I.R.A. - Firenze
ESACTA - Roma
GEOMAP - Firenze
I.R.T.A. - Milano
I.R.T.E.F. - Firenze
SARA - Roma
Ufficio Tecnico Leopoldo Carra - Parma

Firms building photogrammetric apparatuses.

Officine Galileo - Firenze
Ottico Meccanica Italiana - Roma

Of the three State Organizations attending to cartography, only the Istituto Geografico Militare (I.G.M.) performs the surveys directly and is, therefore, adequately equipped to carry out the whole cycle for production of maps, that is from the flight up to the printing.

On the technical and scientific point of view, I.G.M. is, with no doubt, the most important cartographic Organization in Italy, its instrumental equipment is considerable, its production good. The information they sent, together with that sent by the other Organizations, has been used to sketch a general landscape of the photogrammetric activity in Italy.

The Direzione Generale del Catasto applies to Photogrammetry for the survey of cadastral maps; the whole work, however, is undertaken on contract by private firms. In the period which the present report refers to, the Direzione Generale surveyed nearly 3.500 hectares at a scale of 1 : 1.000 and 800 hectares at a scale of 1 : 2.000 of prevaillingly urban zones.

As to the studies, the Direzione Generale attends to a new regulation for the technical testings of cadastral maps, particularly for what concerns the determination of the tolerance limits.

1 - The nature and the extent of the photogrammetric activity with industrial productive character.

1.1 Taking operations: 292 flights have been carried out to cover the areas indicated in hectares here below at the various scales:

1 : 5000-1 : 9000	1 : 10000-1 : 19000	1 : 20000-1 : 30000	other scales
243.000 ha	555.500 ha	5.380.000 ha	1.320.000 ha

The taking cameras which have been more widely used are: Wild RC-5a, Galileo Santoni VI, Zeiss QMR/A, Foma Nistri, Wild RC-8, RMKA 15/23. The photographs were generally taken on films with acetate support.

1.2 In the surveys for the 1 : 25000 scale cartography, IGM adopted, for 98%, the analogical aerotriangulation for blocks.

The photogrammetric firms, for 40% of their production, made use of aerotriangulation either for blocks or for strips; for the remaining 60% about, they applied to trigonometrical networks, sometimes adding to the already existing some new points. Only in few cases the double flight at different altitudes was used.

1.3 The cartographic plotting of the aerial photographs supplied mean and large scale maps covering about 6 million hectares, thus distributed according to the different scales:

1 : 5000	1 : 5000-1 : 9000	1 : 10000-1 : 19000	1 : 20000-1 : 30000	other scales
599.000 ha	768.500 ha	820.000 ha	3.098.000 ha	150.000 ha

While the production of I.G.M. is entirely devoted to the State official cartography (1 : 20.000 scale), the private firms carry out cartographic work with different aims. These aims we have indicated here after, without specifying what is the importance per cent of each of them in the whole production: land reclamation and irrigation, town planning, roads and railways, agrarian and hydrologic studies, civil engineering in general, cadastre, mines, besides, of course, the general cartography carried out on commission of local Institutions.

The capacity of production of the cartographic firms has been used for 80% only; exception is made for I.G.M. whose availability of staff and equipments has always been employed in full.

The instrumentation used is represented by all the instruments of national production, namely those by Officine Galileo (Stereocartograph IV, Stereosimplex III and II) and those by Ottico Meccanica Italiana (Photostereograph 3, Photocartograph V, Analytical Plotter AP/C, Stereocomparator TA3); moreover, some instruments Wild (Autographs A8 and A2) have been also employed.

1.4 As to photo-interpretation, we cannot help mentioning the powerful « Atlante delle sedi umane », edited by I.G.M. and, particularly the II volume, dealing with the ancient zones populated by the man, which has recently appeared.

Some specialized firms have employed photointerpretation, mainly abroad, in work of applied geology, particularly in the field of hydrology, of geothermal and petroleum exploration, of analysis of fractures.

About 1.100 km² have been surveyed, on the whole, by the photogeologic method.

1.5 In the current use, photogrammetry has been employed very seldom for special applications: however, mention is to be given to the surveys of some important architectural monuments carried out according to the photogrammetric method by firms and university Institutes.

2 - *The new methods, new equipments and aims worked out and tested in the production field.*

Here are collected all the instrumental and operative innovations, the original applications successful not so much in the research, as rather in the production field, both in the case of old problems faced with modern methods and in the one of new problems solved photogrammetrically for the first time, at least in Italy.

2.1 The most relevant innovations of methods and instruments are:

2.1.1 For the creation of ground networks: the use of tellurometers and

similar instruments; the use of analytical triangulation and aerotriangulation by independent models.

2.1.2 For the taking of the photographs: the use of special polyester supports; the use of colour films.

2.1.3 For the plotting: the use of new instruments, recently built by the national industries (Simplex II c, AP/C, Stereocartograph V).

2.1.4 For the computations: the more and more increasing use of electronic computers and, particularly, the use of the desk electronic computer « Olivetti, program 101 ».

2.1.5 For the drawing: the use of methods of direct drawing during the plotting, thus avoiding the phase of the engraved drawing.

2.2 The most interesting innovations in the aims are:

2.2.1 As to the aerial surveys: they have been used for determining the density of cars in the town parkings at the different hours; for the statistical study of the new residential areas in order to localize the big stores; for the study of landslip movements and of downward slopes; for the study of morphology and of variations in the shore-lines; for the realization of a special type of geomorphologic maps (topomorphic maps) of quick production and low cost, used as planimetric basis, in case conventional maps are not available (about 50.000 km² at the scales 1 : 50.000 to 1 : 25.000).

2.2.2 As to the photogrammetric plotting: it has been used in the road planning; in the determination of cadastral small parcels barycentric coordinates; in the determination of volumetric distribution of buildings in town cartography, by plotting the altitudes of their tops.

2.2.3 Photogrammetry is also used for special purposes, such as the determination of deformations in models of big industrial structures, the determination of erosion and transport of materials on hydraulic models; the construction of models for restoration of ancient paintings.

3 - Contribution of Photogrammetry in solving problems of economic politics.

3.1 Photogrammetry proved to be very useful, thanks to the possibility of a quick intervention, to the complete documentation and metric information it offers, on occasion of the tragic event of the « Vajont » dam and of the more recent alluvions of Autumn 1967: the flight effected along the rivers in the most damaged areas, just after the catastrophe, allowed the identification of the points where the banks were broken, of the weak points and the measure of the flooded areas, so that a prompt intervention was made possible.

3.2 A wide town planning program for the most important centres of life is being achieved. In all problems connected with the formulation of rational and organic schemes, with town planning and road studies and in those concerning the preservation and the increasing of parks and gardens in town, photogrammetry revealed and reveals still as an indispensable instrument, both as a means for obtaining in a short time a complete cartography and as providing the important photographic document. Its applications in town planning are progressively increasing.

4 - Researches of scientific and technical character.

Such researches have been carried out mainly in the State Institutions, in the Universities, in the Firms building photogrammetric apparatuses.

4.1 Researches and experiments on the instruments.

4.1.1 For the taking: study, planning and production of a new objective lens for industrial purposes taking cameras; planning and production of the Den-drophoto camera for ground forest determinations.

4.1.2 For the plotting: the improvement of the Stereosimplex Santoni mod. II c for superwideangular takings; the realization of an orthophotoprinter to add to the AP/C; the planning and the realization of the new monocomparator and stereocomparator Galileo Santoni; the realization of the new analogical plotter of II order RA/II; the building of instruments to make measures and statistic computations for fractures and geomorphologic analysis quicker and surer.

4.2 The subjects of both theoretical and experimental researches as to the operations were:

4.2.1 Aerial triangulation. Methods and procedures of both analytical and ana-logical triangulation have been studied; the possibility of using non universal instruments in the triangulation with independent pairs has roused much interest.

Researches of experimental an theoretical character in order to identify the causes of error, are being carried out. The adjustment of blocks of strips is still a topical subject in the scientific field; Italy has participated actively to the OEEPE's researches. Concerning the statistical study of the causes of error in the elementary operations of triangulation, a new address is to be pointed out: it consists in the analysis of the results of strips repeated several times (15-20 times).

4.2.2 Plotting. Several studies, some already published, some others not yet, have been carried out on the use of the AP/C for the precision plotting.

4.2.3 Special applications. Photogrammetric taking of car mechanical pieces and bodies was the subject of careful studies in order to evaluate the precision of the survey for points of surfaces whatsoever. An application of such procedure to the restoration of paintings on tables is being experimented at the Resto-ration Laboratory of the Superintendence of the Arts in Florence. In the group of special researches are to be included also those concerning the study of colour photogrammetric takings with different material and treatment and, moreover, the studies on the possibility of using in photogrammetry, for or-dinary purposes, panoramic cameras with transversal range of 180°. Mention must be given of the studies on the application of numerical photogrammetry procedures to the solution of problems connected with the experimental studies on physics of the elementary particles, in large dimension bubble cameras.

5 - *Directions of the progress of the photogrammetric technique.*

5.1 In the instruments: the most evident direction concerns, as to the control networks, the use of analytical triangulation and, consequently, of the stereo-comparators; as to the plotting, there is an increase in the use of non universal instruments. Also the triangulation by independent pairs with non universal instruments is developing.

5.2 In the methods: for some special purposes, which will be of the highest importance in the near future, numerical procedures are in the foreground. As a consequence, the use of automatic numerical recording will necessarily spread more and more.

5.3 In the computations: big electronic computers will come into common use,

as well as those of smaller capacity but cheaper and easier to be used, like, for instance, the desk computer Olivetti, Program 101.

5.4 In special applications: the advantages of metric and documentary character are more and more appreciated also in other fields and photogrammetry will be soon widely used also for non cartographic purposes on the industrial productive plane.

Before concluding by the essential bibliographic notes this short, synthetic and schematic review of the photogrammetric work carried out in Italy, we cannot help mentioning the frequent request for starting the drawing up of the national technical cartography at 1:10.000 scale. The Italian Geodetic Commission has undertaken the burdensome work of defining the problem technically, in all its administrative and economical aspects. This work is already at a good point. Also in the political field a large current of consent is delineating and we hope it may lead to insert this necessary work into the economical program of the next years.

On the more strictly technical point of view, the National Research Council has appointed, at the Politecnico of Milano, an «Enterprise» of research, aiming to study the problem of determining the control points by means of blocks of strips. An experimental polygon 30x30 km² established near Florence, containing over 200 signalized points, has been flown at a height of 4.500 m and has been covered by 6 longitudinal and 3 transversal strips. Such photographic material is now used, for a large set of different experimental tests, by the Institute of Geodesy, Topography and Photogrammetry of the Politecnico of Milano.

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