

## ITALY

General Direction of Cadastral Survey and of the Technical Services  
of Finance Department

### **Rules for the accomplishment of air photogrammetric surveys on large scale**

*Communication by the General Director Prof. GIOVANNI BOAGA to the  
7th International Congress of Photogrammetry — Washington 1952*

As is known, Italy has been the first Nation that concretely applied air photogrammetry for cadastral mapping, i. e. for cartographic elaborations on large scales (general scale 1:2000, particular scales 1:500, 1:1000 and 1:4000), having a high degree of accuracy.

Already in 1934 the Italian Cadastral Survey presented to the 4th International Congress of Photogrammetry at Paris the first cadastral map obtained by means of the aerophotogrammetric method. Besides the usual planimetric design, this map contained also the altimetric representation by means of contour lines and spot heights.

Since that time and after having overcome the initial difficulties, air photogrammetry has become progressively more important among the surveying methods used for cadastral mapping in Italy; from year to year larger areas were surveyed by means of the new method.

It stands to reason that for the application of air photogrammetry to cadastral purposes, particular studies and researches were needed at the beginning as well as during the following period of development. A particular experience as regards application was so gathered and used for the elaboration of apposite surveying rules by means of which a good result of work is assured to the Cadastral Administration.

At first only summary regulations with regard to photogrammetric proceedings were issued by the Cadastral Administration in collaboration with the private enterprises charged with the accomplishment of surveys, while particular attention was directed to opportune testings during the single working cycles (preliminary testing) as well as after the completion of work (final testing).

At that time, a particular importance was attributed to the preliminary testing, which consisted of a series of controls and determinations carried out



by the Administration itself with its own means, contemporary or a little later to the accomplishment of each single operation by the enterprise.

For example, beside the control points normally determined by the enterprise for orientation of the pairs of photographs, the Administration determined for its own account the co-ordinates as well as the height of some other points (points for preliminary testing). These elements were used during the plotting work for controlling whether the enterprise has carried out the reconstruction of outer orientation with the necessary care and accuracy.

For some small areas and by means of its own personnel, the Administration carried out tacheometric surveys of boundaries and limits of property as well as of topographical lines, buildings, etc. During the photogrammetric plotting, the representation obtained could be compared in this way to the one desumed from the tacheometric survey.

The control system as described above was of great importance during the first years; besides the guaranty afforded to the Administration as regards the regular accomplishment of each single operation, served for training of personnel and made possible the gradual improvement of the practice of air photogrammetric surveys for cadastral purposes; it made possible also the ascertainment and the elimination of several imperfections and sources of errors and furnished abundant data for statistics and researches.

The fore-said initial regulations and especially those regarding the preliminary control, were co-ordinated after a ten years of application and collected in the volume: « Cadastral mapping by means of air photogrammetry. Rules for the Control Service ». The regulations were issued by the Italian Cadastral Survey in 1944 and may be valued as a considerable contribution given to the field of photogrammetry.

However, the rapid evolution of air photogrammetry and the always larger development of its applications let the fore-said Rules appear soon as surpassed.

The controls carried out for preliminary testing appeared too expensive and not absolutely necessary after the conclusion of the experimental stage of cadastral mapping by means of air photogrammetry; further such controls would have delayed or even hindered the rapid accomplishment of air surveys of vast areas. Having to-day both the enterprises and the Administration well-trained personnel at their disposal, a simplification of the controls appeared justified, provided that precise regulations would be issued as regards the proceedings and operations of air photogrammetric surveys.



The elaboration of apposite « Rules for air photogrammetric surveys » was therefore retained necessary.

These Rules were issued recently (in 1952); they regulate each single operation to be carried out for the production of the cadastral map by means of air photogrammetry, i. e. the operations from the marking of points on the ground before the flight to the cartographic design of the map obtained by plotting of the photographs, and to testing of its accuracy.

The « Rules », we have the pleasure to present to the 7th International Congress of Photogrammetry, firstly deal with the characteristics of the areas where the application of the air photogrammetric survey appears more suitable.

Further the accomplishment of each single operation necessary for the production of maps is regulated: these operations are the following ones:

- a) marking of points on the ground before the flight;
- b) organization of the photographic flight;
- c) preliminary reconnaissance of the ground on the hand of magnified photographs;
- d) choice of control points for the outer orientation of photographs and determination of their planimetric position and height;
- e) plotting work (orientation of the pairs of photographs, plotting of planimetry, plotting of contour lines);
- f) indications for the choice of contour intervals;
- g) cartographic completion of the map;
- h) controls to be carried out during the work;
- i) final testing;
- l) degree of accuracy obtainable and limits of error.

Besides the instructions for the accomplishment of new surveys, the « Rules » also deal with the bringing up-to-date of old maps as well as with the integration of planimetric maps by means of contour lines.

The volume of the « Rules », we have the pleasure to distribute to the attendants at the 7th International Congress of Photogrammetry at Washington, contain therefore the entire regulations, on the base of which the Administration of the Italian Cadastral Survey carries out or let out on lease to private enterprises the air photogrammetric mapping work. The regulations include both general and particular instructions and can be usefully applied to any other survey on large scale, if a high degree of accuracy like that of cadastral maps is required.

The proceedings explained in the « Rules » constitute the result of the experience acquired by the Italian Cadastral Survey during nearly 20 years of



air surveying, which considerably contributed to the completion of cadastral mapping of the entire territory of Italy and enabled to furnish the existing maps with contour lines; that is an important element as regards the use of maps for technical purposes, besides the normal civilian and fiscal aims of the Cadastral Survey.

I retain that the « Rules » have — besides the field of cadastral purposes — also a technical and scientific value and that they constitute a contribution not to be disregarded, given by the Administration of the Italian Cadastral Survey to the further progress of photogrammetry, i. e. to the progress to which Italy dedicated its proper activity, through the International collaboration, since the first beginning and will do it in the future too.

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*The General Director*  
Prof. G. BOAGA

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### **Instructions pour l'exécution des levés aérophotogrammétriques à grande échelle**

*Résumé de la communication du Directeur Général du Cadastre Italien*  
Prof. GIOVANNI BOAGA

Afin de régler et de discipliner l'exécution des opérations de lever aérophotogrammétrique à grande échelle, la Direction Générale du Cadastre Italien a fait compiler la nouvelle « Instruction pour le lever aérophotogrammétrique », en perfectionnant l'Instruction de service précédemment en vigueur.

Dans la nouvelle Instruction, qui sera distribuée aux Participants au VII<sup>me</sup> Congrès International de Photogrammétrie, sont données des indications de caractère général au sujet du choix des zones dans lesquelles l'application de lever photogrammétrique est plus indiquée. Le développement de chaque opération relative à la formation des plans aérophotogrammétriques du nouveau Cadastre italien est également réglé, c'est à dire la signalisation du terrain, l'exécution des vols de prise de vues, la reconnaissance préliminaire du terrain à l'aide de agrandissements des vues, la choix et la détermination planimétrique et altimétrique des points de contrôle, les opérations d'atelier (le rétablissement de