

ITALY

GENERAL DIRECTION OF CADASTRAL SURVEY AND OF THE TECHNICAL SERVICES OF FINANCE DEPARTMENT

Republic of S. Marino Air Photogrammetric Survey for Cadastral Purposes

*Communication of Dr. Eng. P. BELFIORE
Chief Engineer of the Italian Cadastral Survey*

The Republic of San Marino is the oldest of European free States. Established 1651 years ago, its territory is overlooked by Mount Titano (738 mts) and completely surrounded by the Italian territory at the latitude of $43^{\circ} 51'$, 23 Kmts West of the town of Rimini and the Adriatic Sea.

Always at the head of human progress for civil developments, the San Marino Government decided the renewal of its Cadastral map, which was 120 years' old according to the most up-to-date method for aerial survey, and entrusted the works to the Florence Firm E.I.R.A.

The Survey was carried out by using the Galileo-Santoni Mod. III aerial camera, and the high accuracy Galileo-Santoni Mod. III plotting apparatus. The geometrical survey operations were started in 1950 and completed in 1952. Technical supervision was supplied by officials of the Italian Cadastral service, who also carried out accuracy and detail effective representation tests, with quite satisfactory results.

San Marino territory is steep owing to the slope of Mount Titano declivity and to wide zones of argillous soil which present deep erosions. The flight was effected at an average absolute height of about 2.000 mts; 120 stereoscopic pairs having an average 60 % overlap in the line of flight, and an average 20 % side-lap, between adjacent parallel flights, were secured.

54 triangulated points and 301 plotting control points were determined; after plotting operation, maps were completed using tacheometric traverse lines, which required a total of 586 stations and about 12.600 detail points.

The whole territory was plotted on 67 (1.00 x 0.70 mts) map sheets; 58 were drawn in the scale of 1 : 2.000, provided with 2 mt. contour lines interval; the main town of San Marino and the villages of Borgomaggiore, Serravalle, Fiorentino, Dogana, Faetano, Montegiardino, Chiesanuova, etc., were plotted on 9 map

sheets at 1 : 1.000 planimetric scale; here numerical height data were completed by contour lines, having 1 mt. of interval.

The precision levelling of the territory which was taken as a basis for the introduction of all the altitude data, was referred to and based up on the datum points of the nearest levelling lines of the Italian territory.

A particular plotting and cartographic operation was performed for the argillous zones, which show the erosion of soil; special sheets of the map, providing fully detailed contour lines were made; such maps will be used for the study of the works designed to the fertilization of the soil.

The results of the map accuracy tests carried out by Italian Cadastral engineers are collected in about 6.300 planimetric measurements, only the 6,5 % of which exceeds the close requirements of the Italian Government for aerial photogrammetric survey.

As for elevation tests, trigonometric or tacheometric levelling with taped distances on an overall length of 20 Kms was performed, by totally testing 1.132 contour lines, only the 0,35 % of which exceeded Italian Cadastral requirements while the average elevation error on controlled contour lines was ascertained to be of 0,85 mets.

As soon as the plotting operation were completed, the maps were copied on copyrite sheets and immediately printed in two colours, using black for the representation of the planimetric details and brown for contour lines and elevation numerical data.

After collecting all topographic data, land estimate operations were immediately begun and rapidly performed. These operations will allow to apply well distributed and not heavy taxes on the real estate patrimony of San Marino.

The survey and estimate operations relating to residential buildings have also been extremely facilitated by the fact that flights had already been made and plotted maps were available.

Although it does not relate to a very wide territory, get the accomplished work can be considered a model for the accuracy of the maps, the elegance of the drawing, the neat details and for modern criterion which have been adopted in carrying out all the operational steps.

The broad minded members of San Marino Government and particularly the Director of the Republic Tributary Department have afforded the application of up to date, syntetic provisions of the law, wich will make the new Cadastral unit - now almost ready - one the simplest and most useful in the world.