SANTONI SOLAR TRIANGULATION

Methods of Operation, Adjustment, and Results of Recent Practice

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The latest studies and experimental work performed by I.G.M. and Ente Italiano Rilievi Aero Fotogrammetrici in the field of aerotriangulation with Santoni's method, have been intended for finding out the working procedure most suitable for its practical application (*Preface*).

It is established that Santoni's method of aerotriangulation differs from other methods in that the determination of the transversal and longitudinal tilt of each new photograph does not depend on the elimination of the vertical parallaxes among various points of the optical model, but on the knowledge of the altazimuthal position of the sun and of the angular position of the camera axis with respect to sun direction at the moment of exposure. The analytical procedure and the special instruments are described by which the above-mentioned inclinations can be determined from the data collected from the solar photograph (*Chap.* 1).

A critical examination of the special apparatus (solar periscope, solar photogoniometer, solar mechanical calculator) and the usual instruments (Santoni Camera model IV., Stereocartograph model IV.) which are needed for an aerotriangulation according to the Santoni solar method, leads to the exposition of the drawbacks and advantages shown by experience (*Chap.* 2).

Actual experiments are then discussed, and the conditions governing exposures and ground surveys are described. It is shown that as a result of ground survey the strip — about 100 km. in length — disposes of three terrestrial controls; at the beginning, at the middle and at the end (*Chap.* 3).

From the field surveys one passes to the preliminary calculations and tests preceding the connection of photographs.

The process involving the definite setting of the camera-periscope, with respect to the plotting instrument is then carefully described. This operation is carried out on the pairs provided with ground control, and leads to the determination of a constant — if there is any — to be assumed as corrective factor for all pairs (*Chap.* 4).

The working details of photographic bridging are then discussed. The analysis of the nadiral photograph connection leads to the noteworthy conclusion that it can provide the swing values of the intermediate photographs for the subsequent calculations; but it cannot always provide a reliable value of the systematic error in the transfer of swing. The technique of final solar connection is then described, with the rough results at the end of the strip (*Chap.* 5).

Passing to the selected method of adjustment, its informative criteria are outlined and can be summed up as follows:

1) The systematic error, whatever it may be, is calculated according to its effects inside the last model.

2) According to the amount and sign of the deformation which is examined in that model, the systematic corrective factor is calculated, and then the strip adjusted.

3) The residual closing errors, referred to the geodetic net, are ascribed to accidental errors, and adjusted linearly.

The results obtained show very perceptible accidental errors mostly due, in the present case, to the photographic definition. In such cases the solar method supplies *the possibility of reducing several bridges of the same area to a single angular bridge*, so that the influence of the residual accidental errors can be made evident independently of the angular setting of the cameras. It follows that their influence may be reduced by taking the mean of the various connections. The final results prove that the solar method also allows removing *a posteriori* many inconveniences in taking the photographs (*Chap.* 6).