the value of each range marker shown. Range marks showing 1, 5, or 10 nautical miles may be displayed on the scope.

Conclusions

Radar photography has provided the photogrammetric engineer with a new tool for the preparation of maps and charts. The present art, from the standpoint of refinements of equipment or methods of compilation, has not progressed to the extent that any definite conclusions can be drawn. Radar photography has decided advantages and disadvantages as compared to visual photography. The electronic engineers have a big problem in improving the radar equipment and the photogrammetric engineers must devise ways and means of using this photography for the compilation of charts of a known accuracy.

It is not expected that charts made by electronic means will replace conventional methods in the near future. Radar photographs do have a place in a charting program and as the knowledge obtained by working with this type of equipment increases, more applications will be found for their use.

GALILEO-SANTONI STEREOCARTOGRAPH MODEL IV*

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Abstract

This paper will cover the characteristics of the Stereocartograph Model IV, plotting instrument, with regard to its adaptability to different focal lengths, camera lens characteristics, diapositive sizes and ratios of enlargement and reductions. Comments will also be included relative to its accuracies and economical adaptability for compilation purposes, its bridging possibilities, its personnel requirements and training required for operation.

There will also be remarks in the paper speculating on the increased use of first-order instruments as indicated by the present mapping trends toward larger scale, smaller contour interval work.

FOR the past several years we have had a great interest in large scale, small contour interval mapping and could see the future in this type of project. However, we were skeptical of the economic feasibility of a commercial organization using a first-order instrument for anything other than full-time extension work. We realized that this type of instrument would be highly advantageous for purposes of extension of control, but we were doubtful if the cost of the instrument could be justified on this one factor.

After considerable thought and investigation, we reached the conclusion that any instrument in this price range would have to be extremely versatile to meet the varied and rapidly changing demands of the clients of a commercial company, and that it would have to operate economically for compilation as well as extension. After investigating the first-order instruments manufactured, we decided that the Stereocartograph Model IV would best meet our needs for versatility, and that it had several features that could be used to great advantage in what we believe to be the future mapping trend.

The Abrams Aerial Survey Corporation obtained one of these instruments and it was put in operation in our Lansing plant on the first of March, 1954. After a year's operation on a three-shift basis, we are convinced that the choice was a good one, as the instrument has been completely satisfactory from both an economical and operational standpoint.

There follows some of the characteristics of this instrument that particularly influenced our decision to obtain the Galileo-Santoni Stereocartograph Model IV:

First, the Galileo-Santoni instruments

* Presented at 21st Annual Meeting of the Society, March 7–9, 1955, Hotel Shoreham, Washington, D. C.

will consent to the use of photography from practically any precision camera built, using focal lengths from 98 to 220 mm. and diapositives of any thickness and any size up to 9″ × 9″.

Second, it is particularly adaptable to various camera lens characteristics, as it uses a correction cam to remove lens distortion. These cams cost only $40 per set, and are ground to the exact focal length and lens characteristics of the particular camera used. This allows the economical use of existing photography and gives a more accurate solution than could be obtained with any instrument using a mean curve correction system.

Third, the model is viewed at a 9 time enlargement which gives a high degree of accuracy in the horizontal as well as the vertical solution.

Fourth, the instrument will consent to any degree of tilt from vertical to terrestrial with no dead or unuseable area in the 90 degrees. As the model always appears in a vertical plane, regardless of the photography used, it is easy to convert operators from Multiplex or Kelsh to the Stereocartograph.

Fifth, we were also greatly influenced by the large range of reduction and enlargement from photo-scale to manuscript. The model is established at from a $\frac{1}{2}$ reduction to a 4.5 enlargement. These ratios, combined with the gears to the plotting table which can vary from 5 to 1 to 1 to 5, give a possible plotting scale of 1/10 to 25 times the photo scale, depending on focal length of camera. With a 6″ camera, this is limited to a $\frac{1}{5}$ to a 16 time enlargement.

Sixth, the optics in the instrument are fixed so that there is no moving optical train to keep in adjustment. There are only five reflectors between the diapositive and the eye, which tends to lessen the light loss and give a clear sharp image at all times.

Seventh, the Galileo-Santoni Model IV is optical reversing, and is equipped with X and Y as well as vertical scales that can be read from the operator's seat. It is therefore possible to use a mathematical solution for both horizontal and vertical control extensions, as well as a graphic solution. It is equipped with drums that read both in feet and meters for elevation,

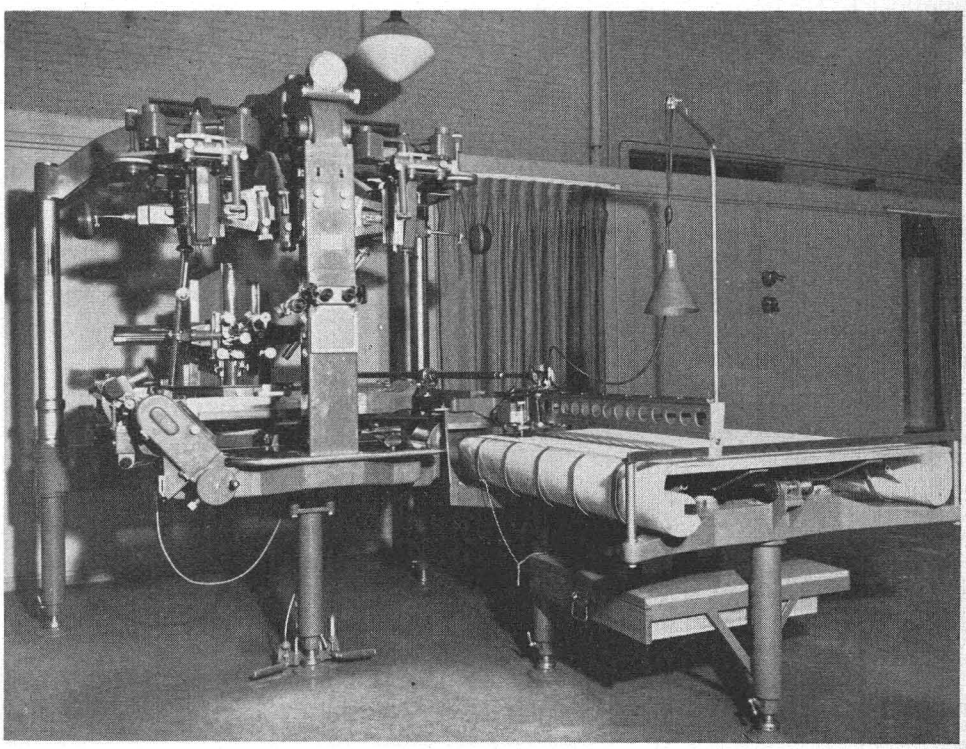

FIG. 1

and can be used either way without making any changes in gearing or replacement of drums.

We have found that the Stereocartograph maintains its calibration excellently. In the year of constant three-shift a day operation, it has been necessary to spend less than two hours a week on calibration, cleaning and maintenance. The instrument has no gadgets to get out of adjustment and the machine work is extremely precise. The split gear system of eliminating back lash and the many counter balances make it a smooth, easily operated instrument.

The Stereocartograph Model IV requires only a single operator which is a large factor in the conomical operation of the instrument. The fact that the hands are used for the horizontal and vertical movements makes it possible for a Multiplex operator to easily adapt himself to this equipment. It has been our experience that an average operator can start production after approximately 16 hours practice, and that he can produce a normal amount of work after 100 hours of operation on the instrument.

We have used "*C*" Factors from 1,500 to 1,800 for compilation purposes and have found that the results are completely satisfactory. Our instrument has been used more largely for compilation than for extension due to the demands of our clients. The extensions accomplished have been field checked and we feel that their accuracy will compare favorably with extensions accomplished on any other first-order instrument now manufactured. During the next year it is probable that our Santoni Model IV will be used primarily for extension work. We are now having a Stereosimplex Model III installed in our plant which will be used solely for compilation. However, the Santoni Model IV can be economically used entirely for compilation or partially for compilation and extension if it is operated approximately 120 hours a week.

We have been doing considerable research which I had hoped to have complete for presentation at this meeting, but the pressure of work has delayed the final report. Nevertheless, we can state that we feel sure from the indications of our completed tests that we can compile 20-foot contour interval maps that will meet standard map accuracy and standard map content, from 1:60,000 to 1:70,000 photography. We feel that the map content can be obtained from this photography as we view the model at a scale of 1:6,600 to 1:7,700. This is considerably larger than the model is now viewed on standard practice for this type of mapping. To accomplish this type of work, we found that it would be necessary to correct for the earth curvature. To accomplish this, we have obtained cams that are not only corrected for lens distortion, but also corrected to remove the earth curvature. It is our opinion that with the probability of greater flight heights to come, this feature is going to be a very advantageous factor in the economical mapping of larger contour interval work on this type of instrument.

There is at the present time an increasing demand by highway department, consulting engineers, land use planners and others for topographic mapping at scales of $1''=50'$ and $1''=100'$ with contour intervals of 1 and 2 feet. There is also an ever-increasing confidence in photogrammetry, by even the most skeptical of the engineering profession. This demand for accuracy and versatility will be greatly reflected in the increased use of first-order equipment for compilation, as well as extension. The demand of clients for this type of work will cause practically every commercial company in the United States to obtain at least one first-order instrument in the very near future.

Semi-Annual Meeting

The semi-annual meeting of the American Society of Photogrammetry which is to take place in Los Angeles the 7th, 8th, and 9th of September has been greatly enhanced by Mr. Murray Koch of Koch Luggage Company in Corte Madera, California. Mr. Koch has donated a complete set of luggage as a door prize. This complete set of fiberglass luggage is worth several hundred dollars. Many are familiar with Murray's fiberglass camera cases. This luggage has the same fine workmanship. The Society and the Southern California Section in particular, convey their thanks and appreciation to Mr. Koch for his generosity.