work is closely related to our PHOTOGRAMMETRIC ENGINEERING through the proofreading of technical articles and the insistence on standardized symbols and nomenclature.

The Chairman, Mr. E. L. Merritt, has left on November 3rd on an expedition to the South Polar region. The balance of the work of the Nomenclature Committee will be carried out by Mr. A. J. Lundahl.

## PROGRAM COMMITTEE

Two meetings have been held in Washington since the last report was submitted. One meeting held on September 18th in the Auditorium of the U. S. Department of the Interior was devoted to the subject "Airborne Magnetometer and its Relations to Photogrammetry" This was a symposium with Mr. Edmond S. Massie, Jr. as moderator. The speakers were:

Fred Keller, Jr. Geological Survey
Virgil Kauffman, Aero Service Corporation
Joseph E. Burch, Jr., Fairchild Aerial Surveys
Lieut. Comdr. E. B. Roberts, U. S. Coast and Geodetic Survey

This meeting was very well attended and was one of the finest technical sessions we have had.

On October 30th, an impromptu meeting was hurriedly arranged because of the unexpected arrival of Professor W. Schermerhorn, President of the International Society for Photogrammetry. Professor Schermerhorn presented some very interesting information based on his experiences in photogrammetry and on his general experiences during the war.

The Program Committee is now actively engaged in preparation for the Annual Meeting.

## RESEARCH COMMITTEE

*Item No. 1.* MONTHLY ABSTRACT BULLETIN

For the benefit of some members, it is desired to mention that a *Monthly Abstract Bulletin* is issued by the Kodak Research Laboratories, Rochester, New York. This publication contains information of special interest to members of the Society engaged in all phases of mapping and charting.

*Item No. 2.* MECHANICAL FLIGHT LINE INDICATOR

A mechanical device, known as a Shoran Flight Line Indicator has been developed by the Air Force. A national publicity release has just been made. Photographs and a technical description of the instrument were given in many magazines. Operating in conjunction with Shoran equipment, this instrument permits flying straight and parallel flight lines in aerial mapping and charting. This instrument has enabled the flying of flight lines over 125 miles in length with a general deviation of only 250 feet from pre-set courses. Improved versions of this instrument are expected to narrow this deviation to 100 feet or less.

The combined electronic and mechanical operations of Shoran equipment and the indicator provides the pilot of a photo plane with an immediate, visual and precise indication on his instrument panel of any right or left drift from a straight line mapping course.

*Item No. 3.* DIAZO DYE PROCESSING MACHINE DEODORIZER.

Of possible interest to many users of Ozalid type processing machines is an ammonia deodorizer. The use of this deodorizer in conjunction with present machines permits installation without ducts to the out-of-doors previously required. The exhaust duct is connected to the deodorizer which in turn eliminates all ammonia vapors and heat produced by the processing machine. It is understood that Ozalid Division of General Aniline and Film Corporation plans to install a deodorizer in all future processing models produced.

*Item No. 4.* DIAZO DYE COATING MACHINE

Something new in the field of coating machines was recently demonstrated at Johnson City, New York. The Ozalid Division of General Aniline and Film Corporation has designed and built a diazo dye coating machine to accommodate rolls of paper 80 inches wide at the rate of 1000 feet per minute. This machine is approximately three stories in height, 30 feet in width and 90 feet long. It is located in an ultra modern building designed to facilitate all operations of the organization. Of particular interest in the building aside from the coating machine is a diazo dye research department staffed by eminent chemists and equipped with laboratory equipment of the very latest design.

*Item No. 5.* PHOTONYMOGRAPH.

Even though this instrument has a jaw breaking title, it none the less prepares "stick up" titles economically. The machine consists of a base support, optical system, character selection dial and character cylinder. Weight of this machine is not an important factor, since it may be lifted with one hand. In operation, a cylinder containing the style alphabet desired is inserted into the machine. The optical system is adjusted to give the height of lettering desired. Sensitized stick up material receives a projected image of the character dialed by the character selector. The entire operation requires very little elapsed time. When a different style alphabet and corresponding numerals are desired, an appropriate cylinder is selected and inserted in the machine. This machine was on exhibition and was demonstrated during the British Commonwealth Survey Officers Conference, 18–29 August 1947, London, England.

*Item No. 6.* PL-3 STEREOSCOPIC PLOTTER, WERNSTEDT—MAHAN TYPE.

Essentially, this plotter follows the mechanical design of the U.S.G.S. Mahan Plotter, but its photo tables have individual mechanical adjustments for X, Y and Z motion in addition to those for tip, tilt and swing. This type of plotter is now in its third year of successful operation in the Geological Survey, Pacific Division, at Sacramento, California. The instrument permits the operator to obtain a close, sharp, hard stereo model with high resolution and considerable simple lens magnification. It has an unique parallel motion mechanism with great smoothness of action and inherent freedom from back-lash. The wide-angle stereoscope permits theoretically correct spatial orientation for $9\times 9$ photographs made with lenses of focal length from 12 down to $8\frac{1}{4}$ inches; but satisfactory plotting can be done from pictures made with a 6-inch lens with some additional control. The map manuscript is to one side and clear of the instrument body. Contours may be plotted in pencil and inking performed as a separate operation. A universally adjustable pantograph permits plotting from 0.36 to 4.0 times the picture scale. The mechanical design is simple and well conceived, permitting mechanical motions to maintain the close tolerances necessary in a contour plotter. It is easy to align and collimate, and will remain in adjustment over long periods. The Wernstedt floating dot principle is used (U. S. Patent No. 2,303,099), whereby the floating mark is raised and lowered in relation to the spatial model by vertical displacement of the half-dots over the photographs without changing their x-spacing. Thus the instrument automatically plots all contours on a true orthographic projection. The image of both stereomodel and floating dot is in sharp focus. A precision stereoscope with interchangeable eye-lenses permits the individual operator to use the particular lens which gives optimum resolution in his case. Blank lens cells are provided for those who wish to have their spectacle prescription combined with the eye-lenses. This instrument is manufactured by Harrison C. Ryker, Inc., Berkeley, California.

*Item No. 7.* SERIES M11—X MIRROR STEREOSCOPES

Certain modifications in manufacture have been made on the standard M—11 binocular magnifying stereoscope. The original instrument was designed so that many of its parts could be die cast. During the war, the manufacturer was unable to secure the necessary die-casting dies and as a result was forced to make them out of sand castings, which caused certain of the parts to be unduly expensive. By elimination of the costly parts and by substitution of a fixed bracket support casting for the regular M—11 adjustable vertical support, the manufacturer is now in a position to offer a series of instruments with the compactness and wide field of the standard M—11, but at a much reduced price. Harrison C. Ryker, Inc., of Berkeley, California, is the manufacturer of the M—11 and Series M11—X Stereoscopes.

*Item No. 8.* THE SUBTENSE METHOD OF FIELD CONTROL

A Subtense Method of field control is proposed by Don Jackson and Lee Lint of the U. S. Forest Service. This method has passed the theoretical stage and has been tried out on a large scale and checked for accuracy with gratifying results. The method of obtaining fourth order triangulation in connection with surveys of rough terrain such as canyon bottoms which cannot be "seen" from most regular triangulation stations is considered a vital addition to accepted methods of photogrammetric field control. In addition, the method of plotting this control by laying off angles by means of a transit in a large office room is unique. A complete description of this method has been forwarded to the Publications Committee. It is possible that it will receive publication in an early issue of PHOTOGRAMMETRIC ENGINEERING.

*Item No. 9.* NEW APPARATUS FOR LAYING OUT POLYCONIC PROJECTIONS

This instrument designed by Don Jackson and his associates of the U. S. Forest Service employs a regular tube micrometer and a large straight edge with a type of jig for the quick and precise laying of geodetic projection lines. It is much faster and more accurate than the usual method of using a "latitude and longitude" scale. It is especially useful when it is found necessary to duplicate several projections bounded by the same parallels of latitude.

## QUARTERLY REPORT OF COMMITTEE ON MAP SPECIFICATIONS AND TESTS

Two series of equipment tests were finalized during this quarter. The invitation to comment on the draft of simple test procedures applicable to the aerial camera and multiplex reduction printer was answered by the Bausch and Lomb Optical Co., The Engineer Research and Development Laboratories, Army Map Service, and Chattanooga office of U. S. Geological Survey. As the result of the comments by these agencies this portion of the Multiplex Equipment Tests has been revised by the Multiplex Equipment Test Subcommittee. Procedures for the calibration of the Fairchild Camera Transit have been prepared by the Terrestrial Photogrammetric Equipment Test Subcommittee. Both of these tests are submitted with this report with the recommendation that they be adopted as standard by the American Society of Photogrammetry as simple procedures for determining the operating characteristics of these instruments.

The Map Accuracy Specification Subcommittee has completed a review of the presently accepted Map Accuracy specification of the American Society of Photogrammetry in comparison with the "Standard Map Accuracy Specification" issued by the Bureau of the Budget and has discussed map accuracy with the former members of the Map Specification Committee which rendered its "Final Report on Recommended Map Accuracy Specifications" to the President of the American Society of Photogrammetry on January 2, 1940. A suggested revised standard map accuracy specification has been formulated and is being prepared for submission to interested agencies for comment.

The Map Tests Subcommittee has continued its efforts to determine what tests should be applied to determine the quality of maps. Map tests which are in progress by several mapping agencies are in preliminary stages and results obtained to date are not sufficient to warrant definite conclusions.

Mr. Albert L. Nowicki has been added to this committee and will serve as the Simple Stereoscopic Instruments Test Subcommittee, Mr. A. C. Lundahl of the U. S. Navy Photographic Interpretation Center replaces Mr. E. L. Merritt.

## REPORT NUMBER 1 OF SUBCOMMITTEE ON MULTIPLEX EQUIPMENT TEST

### Tests of Aerial Cameras and Multiplex Reduction Printers

1. Purpose and Scope

The purpose and scope of the multiplex equipment tests described herein is to outline a series of simple procedures which will afford the users of this stereophotogrammetric equipment the means of checking instrument calibration, making simple adjustments and determining accuracy of operation. Simple tests requiring no special equipment are developed to insure freedom from error due to those deficiencies short of major breakdowns which would require repair by the manufacturer. Calibrations which must be performed on an optical bench are not considered.

Items of equipment for which tests are proposed include the aerial camera, multiplex reduction printer, multiplex projector and tracing table. Procedures vary in degree of exactitude depending on the means required to execute them. Some are qualitative in nature; others are quantitative when the measuring devices are tools available to the normal user.

The tests are applicable to multiplex equipment manufactured by the Bausch and Lomb Optical Company under both U. S. Army and U. S. Geological Survey specifications and by Zeiss Aerotopograph.

2. Material Required

Equipment required to make the tests should be available to the average user of multiplex plotting instruments. An accurate grid etched on flat glass with lines having a minimum spacing of 1 centimeter and covering the area of the aerial negative would be a desirable tool. It is realized that such an item is not generally available and therefore an accurately ruled templet is suggested as a substitute. A diapositive size grid etched on flat glass is necessary to conduct certain tests; line spacing should not exceed 1 millimeter. At least one such grid should be purchased from the manufacturer. If it is impossible to obtain this item, an adequate substitute can be made by contact printing the master grid to a contrast lantern slide diapositive plate. Only the briefest exposure is required to produce an acceptable negative image. A scale permitting measurements to $\pm .05$ mm. is necessary to give accuracy checks commensurate with the capabilities of the instrument.

3. Test Procedures

A. Aerial Camera—A glass plate negative is exposed in the aerial camera to give an accurate rendering of the fiducial mark silhouettes. Distances between opposing marks serve to check for proper operation of the camera vacuum or pressure and to determine the principal distance of the aerial negative which is a function of film shrinkage. From Figure 1:

$$\Delta a = a_n - a_c \tag{1}$$

$$\Delta f = \Delta a \frac{f_c}{a_c} \tag{2}$$

$$f_n = f_c + \Delta f \tag{3}$$

where $a_c$ = distance between opposing $X$ fiducial marks measured on the glass negative.

$a_{nx}$ = the corresponding distance measured on the film negative in the $X$ direction.

$f_c$ = the principal distance of the aerial camera.

$f_n$ = the principal distance of the negative.

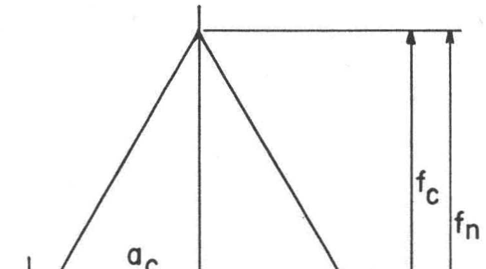


FIG. 1

The value, $f_n$, is used to set the reduction ratio of the multiplex printer. If $a_{nx}/a_{ny}$ $a_{cx}/a_{cy}$ the aerial negative has suffered a differential shrinkage and an average value $a_n = a_{nx} + a_{ny}/2$ should be substituted in (1).

The above differential method of computing which can be performed on a slide rule may be replaced by the direct solution, applying the formula:

$$f_n = f_c \frac{a_n}{a_c} . \tag{4}$$

If $a_{nx}/a_{ny} \neq a_{cx}/a_{cy}$ the aerial negative has suffered a differential shrinkage and average values

$$\left\{\begin{aligned} a_n &= \frac{a_{nx} + a_{ny}}{2} \\ a_c &= \frac{a_{cx} + a_{cy}}{2} \end{aligned}\right\}$$

should be substituted in (4).

An excessive differential shrinkage would indicate unstable film support or an intolerable stressing of the film in the developing process. Both of these deficiencies nullify the precision of the multiplex plotting equipment.

B. Multiplex Reduction Printer.

1. Test for reduction ratio.

Figure 2 illustrates the templet suggested as a substitute for a glass plate grid. The lines should be scratched with a fine needle on transparent topographic acetate or vinylite. Accentuation of the lines is accomplished by wiping with a dark ink or pigment. Distances should be accurate to ±0.05 mm.

Tabulated below are dimensions applicable to the templet sketched in Figure 2 and the reduction printer diagrammed in figure 3.

The reduction printer lens is designed to compensate for distortion in the aerial camera lens. To allow for this compensating action of the printer lens the distance, $b_t/2$, is

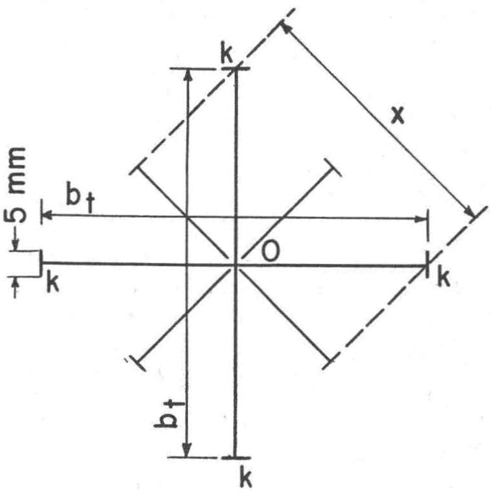


FIG. 2

| *Reduction Ratio* | *Printer lens, f(mm.)* | *Printer dimension* | | *Templet dimension* |
|---|---|---|---|---|
| | | $d_1$ | $d_2$ | $b_t$ |
| 153:30 | 60.9 | 72.8 | 371.5 | 292.0 |
| 153:28.18 | 65.7 | 77.8 | 422.4 | 288.0 |
| 153:22 | 46.5 | 53.2 | 369.9 | 290.0 |
| 131:30 | 59.4 | 73.0 | 318.7 | 266.0 |
| 102:30 | 69.25 | 89.7 | 235.5 | 192.0 |

made equal to the abscissa of the $X$ intercept of its distortion curve. The dimension, $b_t$, tabulated above was determined in this manner. This length is plotted along the templet diagonals having $O$ as a midpoint. A true reduction ratio will be determined since the index marks "$k$" will undergo no displacement in printing.

Place the templet, lines down, in the reduction printer with $X$ and $Y$ axes registered to the fiducial marks. Set the adjusting rings to an average principal distance for the printer being tested and expose a diapositive plate. If the instrument is in adjustment the mean of the diagonal distances, $b_d$, measured on the diapositive will give the value computed from the equation,

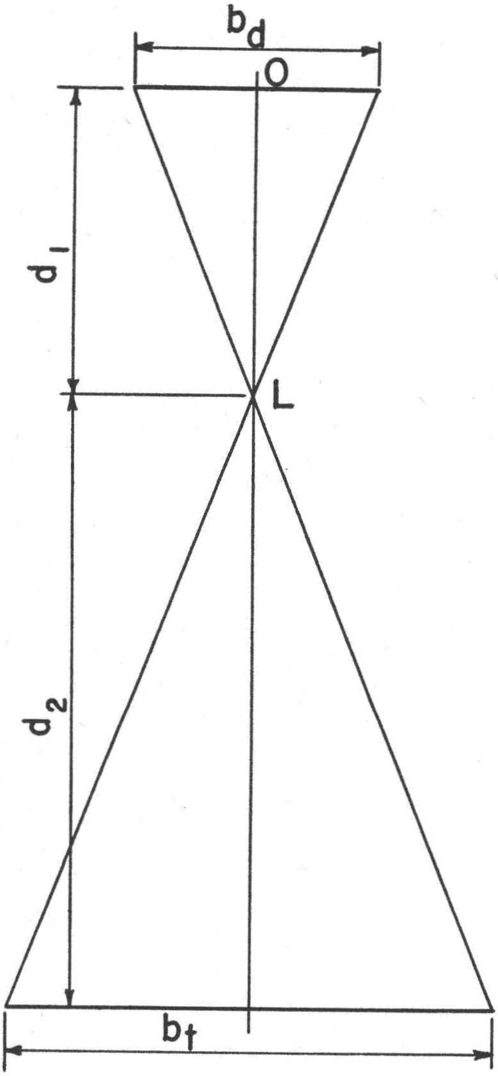


FIG. 3

$$b_d = b_t \frac{f_d}{f_n} \quad \text{to} \quad \pm\, 0.05\ \text{mm.} \qquad (5)$$

where $f_n/f_d$ = the reduction ratio
$b_t$ = the templet dimension indicated in Figure 2

If $b_d \neq b_t f_d/f_n$ the adjusting rings should be set to read the value, $f_n$, computed from

$$f_n = f_d \frac{b_t}{b_d} \qquad (6)$$

where $f_d$ = the principal distance of the diapositive or the denominator of the reduction ratio for the printer being tested.

This test will insure diapositive principal distance accuracies of 0.1%.

An alternate method permitting check measurements at a larger scale can be applied by projection printing in the diapositive printer, a precision diapositive grid of the type mentioned in Section II, "Materials Required." Film negative material on topographic base acetate is exposed in the negative plane of the printer. The dimension, $b_d$, accurately determined by comparator measurements on the diapositive grid represents the standard. The enlarged grid line images measured on the processed negative must be selected to give a diagonal distance, $b_t$, symmetrically located about $O$ and equal in length (within 4 mm.) to the value tabulated opposite the correct reduction printer ratio.

Substitution of $b_d$ and $b_t$ in (6) will give the value of $f_n$ which should agree with the adjusting rings.

2. Test for parallelism of diapositive and negative planes.

Figure 4 diagrams the condition of non-parallelism between negative and diapositive planes in the reduction printer.

$\alpha$ = the angle between the negative and diapositive planes.

$\gamma = t_{an}-1b_d/2d_1 = t_{an}-1b_t/2d_2$ = one-half the angle subtended by the index marks on the templet diagonals.

Figure 5 shows on a larger scale the dissymmetry of the diapositive dimensions produced by non-parallelism of the negative and diapositive planes.

$$CD = b_d.$$

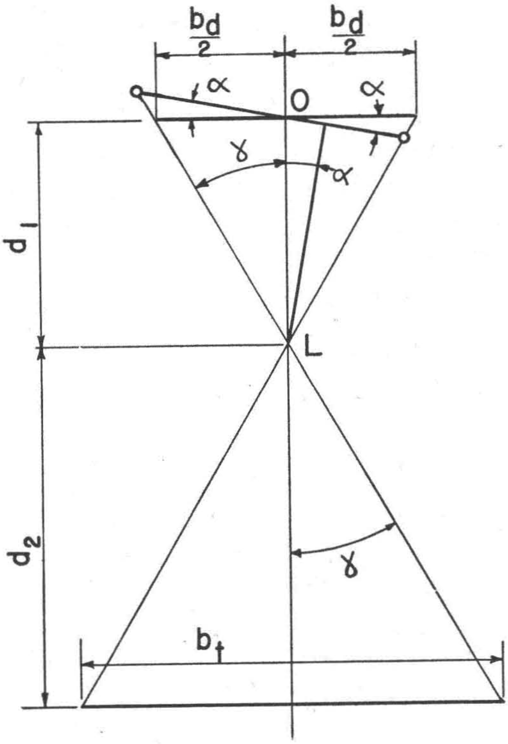


FIG. 4

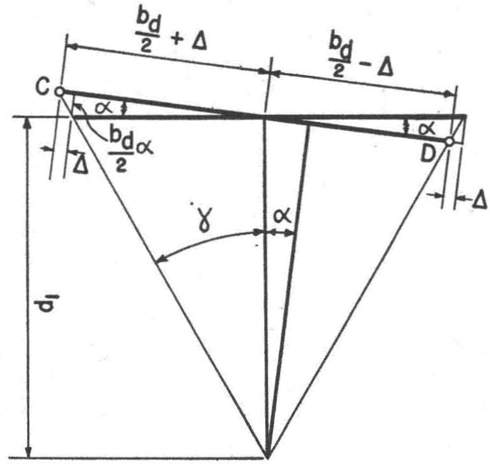


FIG. 5

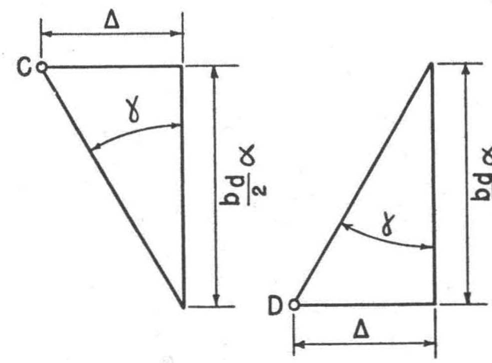


FIG. 6

However, the point, $O$, is no longer the midpoint of $CD$; therefore, to a sufficient degree of approximation:

$$OC = \frac{b_d}{2} + \Delta \tag{7}$$

$$OD = \frac{b_d}{2} - \Delta \tag{8}$$

where $\Delta$ = the difference between the half segments of $b_d$ and the unequal segments as measured on the diapositive.
Subtracting (6)−(7)

$$\Delta = \frac{OC - OD}{2}. \tag{9}$$

Figure 6 represents the triangles at points C and D from which are derived the formula for $\alpha$.

Thus,

$$\tan\gamma = \frac{\Delta}{\frac{b_d}{2}\alpha}$$

but from Figure 5,

$$\tan\gamma = \frac{\frac{b_d}{2}}{d_1}$$

or

$$\alpha = \frac{\Delta d_1}{(b_d/2)^2} \text{ radians}$$

$$\alpha = \frac{\Delta d_1}{(b_d/2)^2} (3{,}438) \text{ minutes.} \qquad (10)$$

For proper operation $\alpha$ should not exceed 30′. To fulfill this requirement in the case of a printer having a reduction ratio 153:30 the distances scaled on the diapositive printed from the templet should be such that $OD-OC<0.2$ mm.

This test made along each of the diagonals will indicate the components of the angle between the negative and diapositive planes. The resultant angle may be computed from

$$\alpha = \sqrt{(\alpha_1)^2 + (\alpha_4)^2} \qquad (11)$$

where $\alpha_1$ = the component along the diagonal in quadrant 1
$\alpha_4$ = the component along the diagonal in quadrant 2.

An angle in excess of 30′ would indicate the need for adjustment of the reduction printer by the manufacturer, assuming proper mounting of the pressure plate and adequate flatness of diapositive plates.

## REPORT NUMBER 1 OF SUBCOMMITTEE ON TERRESTRIAL PHOTOGRAMMETRY

### Field Calibration of the Fairchild Camera Transit Focal Length

1. Purpose and Scope

The purpose of the subject field calibration is to accurately determine the focal length of the Fairchild Camera Transit with minimum equipment or preparation under the conditions encountered during normal field surveying. The scope of the investigation is limited to calibrating the camera focal length and is not concerned with such supplementary details as the location of the plate perpendicular or perpendicularity of lines connecting fiducial marks.

2. Materials Required:

1 Fairchild Camera Transit
1 Tripod with Johnson Head
1 Steel 100′ Chain

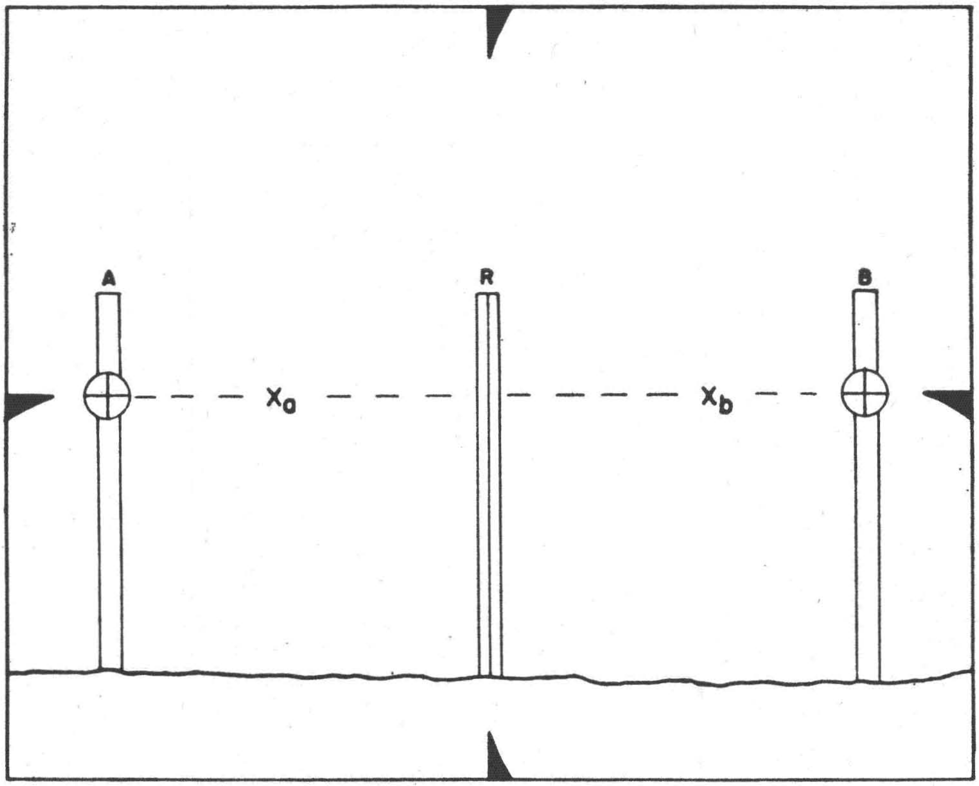


FIG. 1. Camera transit plate representation of target array.

1 Thin Range Pole
2 Philadelphia Level Rods with corner bullseye levels
2 Sliding Targets
3 4″×5″ Kodak Orthochromatic Glass Plates in plateholders
1 Comparator (David W. Mann Instrument used in calculated example)
1 Table of Natural Functions

3. The Field Test

A field site measuring at least 110 feet in length and 55 feet in width is selected. A baseline 45 feet long is measured off and a Philadelphia Level Rod is set up vertically at each end of the line. A thin range pole is set up at the midpoint of the baseline and from it a range line 100 feet long is laid off perpendicular to the baseline. The camera transit is then mounted on its tripod directly over the far end of the range line and pointed toward the range pole.

A series of adjustments is then completed before the first exposure is made. First the camera transit is properly leveled and zeroed when the vertical crosshair of the telescope is made to bisect the thin range pole. With the aid of corner levels the Philadelphia Rods are checked for verticality and the sliding target on each rod is raised or lowered until the horizontal reference mark appears to rest on the horizontal crosshair of the telescope when it is rotated in a horizontal plane from left to right.

With reference to Figures 1 and 2 graphically depicting the actual field condi-

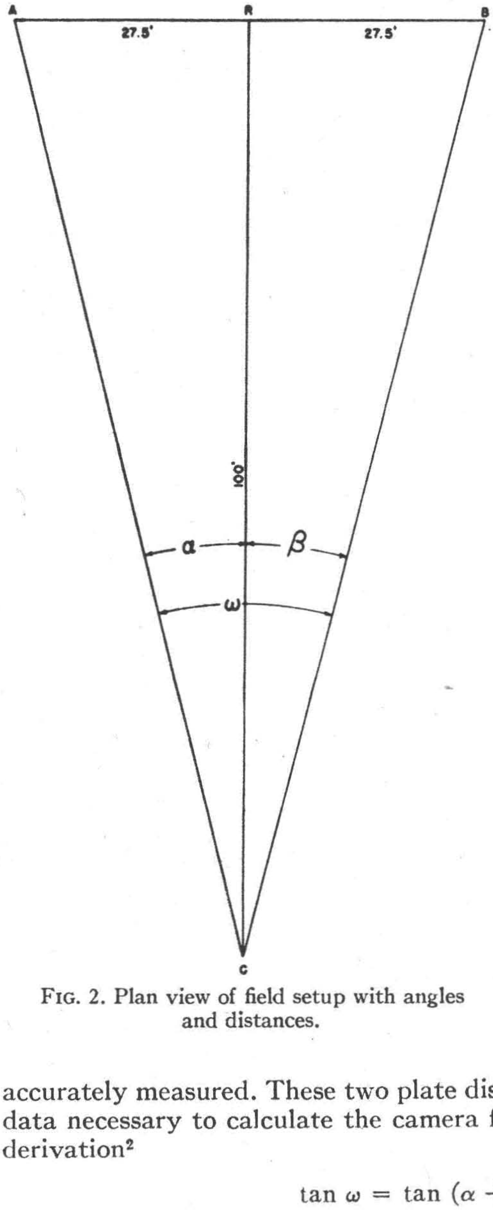


FIG. 2. Plan view of field setup with angles and distances.

tions of the test, it is seen that angles $\alpha$ and $\beta$ are measured from the left Philadelphia Rod $A$ to Range Pole $R$ and from $R$ to the right Philadelphia Rod $B$, respectively. The camera transit is located at $C$. It may be noted in the calculated example that legs $AR$ and $RB$ are not quite equal but the solution is not affected.

Angles $\alpha$ and $\beta$ are measured from the midline of $R$ to the inner edge of the $A$ and $B$ respectively. After carefully reading and recording angles $\alpha$ and $\beta$, the total angle $\omega$ is read and recorded. The sum of $\alpha$ plus $\beta$ should equal $\omega$.

After determining the appropriate exposure with a Weston Exposure Meter, three exposures are made. One exposure is made according to the meter indication, and the other two are made at $\frac{1}{2}$ stop more and $\frac{1}{2}$ stop less than the correct value, respectively. This is done as a precautionary measure as well as to insure three separate sets of readings under different exposure conditions. The plates are developed in D76 for 9 minutes at 68° F. A potassium chrome alum stop bath and hardener are used and the emulsion is fixed in $F5$.[1] Once dried, the plates are taken to the laboratory for measurements with the comparator. The plate distances from left Philadelphia Rod to range pole, $x_a$, and from range pole to to the right Philadelphia Rod, $x_b$, are accurately measured. These two plate distances plus the field angle $\omega$ are all the data necessary to calculate the camera focal length by means of the following derivation[2]

$$\tan \omega = \tan (\alpha + \beta)$$

$$\tan \alpha = \frac{x_a}{f} \qquad \tan \beta = \frac{x_b}{f}$$

$$\tan (\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

[1] For additional details on grain size and image picking see Merritt, E. L. and Lundahl, A. C., "A Reconsideration of Terrestrial Photogrammetry," PHOTOGRAMMETRIC ENGINEERING, Vol. XIII, No. 2, p. 297.

[2] Bridgland, M. P., "Photographic Surveying," Canada Department of Interior Bulletin 56, 1924, p. 10. Also note mistake in last equation where $+b$ has been omitted from numerator of first term on right side of the equation.

$$\tan(\alpha+\beta) = \frac{\dfrac{x_a}{f}+\dfrac{x_b}{f}}{1-\dfrac{x_a x_b}{f^2}} = \frac{\dfrac{x_a+x_b}{f}}{\dfrac{f^2-x_a x_b}{f^2}}$$

$$\tan\omega = \frac{(x_a+x_b)f}{f^2-x_a x_b}$$

$$f^2 - x_a x_b = \frac{(x_a+x_b)f}{\tan\omega}$$

$$f^2 - \frac{(x_a+x_b)f}{\tan\omega} - x_a x_b = 0$$

$$f = \frac{x_a+x_b}{2\tan\omega} + \sqrt{\frac{(x_a+x_b)^2}{4\tan^2\omega} + x_a x_b}.$$

4. Sample Calculations

Two exposures were made at *f*.11 opening with 1/10 and $\frac{1}{5}$ of a second timing. Air temperature was noted at 84° with 64% relative humidity.

*Exposure No. 1*

$$x_a = 57.378 \text{ mm.}$$

$$x_b = 56.671 \text{ mm.}$$

$$\omega = 30°18'00'' \qquad \tan\omega = .5843528$$

$$2\tan\omega = 1.1687056.$$

Using

$$f = \frac{x_a+x_b}{2\tan\omega} + \sqrt{\frac{(x_a+x_b)^2}{4\tan^2\omega} + x_a x_b},$$

the following calculations were performed:

$$x_a + x_b = 114.049 \qquad 2\tan\omega = 1.1687056 \qquad \frac{x_a+x_b}{2\tan\omega} = 97.5857392$$

$$(x_a+x_b)^2 = 13{,}007.174401 \qquad (x_a+x_b)^2/4\tan^2\omega = 9{,}522.976511$$

$$4\tan^2\omega = 1.36587278 \qquad x_a x_b = 3{,}251.668638$$

$$\sqrt{12{,}774.645149} = +\ 113.0249758$$

$$f = 210.610715 \text{ mm.}$$

*Exposure No. 2*

$$x_a + x_b = 114.050 \qquad 2\tan\omega = 1.1687056 \qquad \frac{x_a+x_b}{2\tan\omega} = 97.5865949$$

$$(x_a+x_b)^2 = 13{,}007.4025 \qquad (x_a+x_b)^2/4\tan^2\omega = 9{,}523.143509$$

$$4\tan^2\omega = 1.36587278 \qquad x_a + x_b = 3{,}251.792061$$

$$\sqrt{12{,}774.935570} = +\ 113.0262605$$

$$f = 210.6128554 \text{ mm.}$$

*Comparison of Results*

Average value of the two $f$ values derived = 210.612 mm.
Stamped in the Fairchild Camera Transit $f$ = 209.98 mm.

Difference = .63 mm.
Difference = .30%

## TECHNICAL INFORMATION COMMITTEE

This committee has been continuing its work supplying information requested of the Society. These technical questions which are submitted frequently involve a great deal of research and investigation which is not revealed by the simple listing of the letters shown below.

Inquiries as follows:

No. 1. Mr. B. B. Garland, Hollingsworth & Whitney Company, Waterville, Maine.

Request: Please supply a list of technical publications pertaining to photogrammetry.

No. 2. Mr. Wm. Warren Campbell, 16 Pears Avenue, Toronto, Ontario.

Question: Can ground profiles accurate to one foot be determined by photogrammetric methods?

No. 3. Lt. Henry A. Harrington, Jr., 91st Reconn. Squadron. L. R. Photo, APO 832, c/o Postmaster, New Orleans, La.

Request: Please recommend a suitable ink for titling aerial negatives.

No. 4. Mr. Clyde H. Sunderland, 3535 Brunell Drive, Oakland, Calif.

Requests: Please supply information concerning the manufacturer of the navigational instrument, Pelcrus. What are prevailing charges for photographic reproduction services?

## EDUCATION COMMITTEE

Mr. C. G. Mares of the Naval Photographic Intelligence Center prepared a list of names and addresses of some 250 schools and colleges of engineering, forestry, and geology whose college catalogues did not mention the word "photogrammetry" and where no member of the Society was on the teaching staff. This list was used as an additional mailing list for the September educational number of PHOTOGRAMMETRIC ENGINEERING. Results are beginning to be in evidence as various schools have inquired as to what equipment is needed, where to get it, what textbook to use, and where information can be obtained on the teaching of the subject.

Mr. E. H. Ramey of the U. S. Coast and Geodetic Survey had agreed to prepare a collection of projector slides for the Society illustrating the complete story of photogrammetry together with a written description of each slide. This project has been suggested a number of times as a source of information that may be loaned to any school or organization for showing.

## CIVIL SERVICE COMMITTEE

The report on the Civil Service Committee has been submitted to the Civil Service Commission officially.