

# COMMENTS ON THE *MANUAL OF AERIAL PHOTOGRAMMETRY* TO BE PUBLISHED BY THE AMERICAN SOCIETY OF PHOTOGRAMMETRY

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THE American Society of Photogrammetry is proud to publish in this issue one of the most comprehensive analyses ever written on Analytical Computations in Aerial Photogrammetry. No greater authority could have been found in America to present the mathematical phases of this science than Professor Earl Church of the College of Applied Science of Syracuse University. For years, he has been one of the outstanding leaders in this field. The magnificent work being done at Syracuse has aroused an interest in photogrammetry in other engineering schools in the United States which is gratifying. Most of the credit is due to Professor Earl Church who for years has been driving home the fact that a new tool was at hand to help the surveyor in his difficult task of accurately portraying topographic details. We heartily agree with him in that the principles of Photogrammetry should be taught to all students of Civil Engineering, for its field of application is far reaching and will become more so in the future.

Professor Church's chapter is the first contribution received for the *Manual of Photogrammetry* which the Society is having prepared by outstanding leaders in this specialized field of engineering.

The material will be printed, as received, in succeeding issues of PHOTOGRAMMETRIC ENGINEERING, leaving the logical sequence of the various chapters to the time when the manual will appear in book form. The publisher has been requested to store the type in order to reduce ultimate publication cost of the manual which will be sold to our members at cost of printing and paper.

It will be realized that the Society has undertaken a worthwhile job which will require some time for its completion. Comments and constructive criticisms from the members will be welcome. We need your loyal support to insure that the Society will continue growing in importance as the only organization in the Americas solely devoted to the advancement of Photogrammetry.

In order to acquaint the membership with the scope and magnitude of the manual, the proposed list of contents is given below.

## CHAPTER I—INTRODUCTION

Purpose of this series of articles, scope and laying the ground work for what is to follow.

## CHAPTER II—THE PRINCIPLES OF SURVEYING

A brief description of survey technique, sufficient to show the place of Aerial Photographs in the science of surveying.

## CHAPTER III—AERIAL PHOTOGRAPHS AND AERIAL CAMERAS

### THE PHOTOGRAPH

1. General Discussion:
  - Chemically, why and how a picture is made.
  - Geometry of a photograph.
2. Types: (those in use in America)
  - Verticals
  - Obliques
  - Composites } Illustrations.
3. Relation of scale, focal length, and lens height.
4. Coverage:
  - Giving table listing typical cameras.
5. Collimating marks.

## 6. Identification:

Necessary data that should appear on photograph.

## THE CAMERA

## 1. General Discussion:

Classification; principles of design and construction.  
Accessories; etc.

## 2. Lenses:

Aberration.  
Astigmatism.  
Field.

## 3. Shutter:

Between-the-lens shutters.  
Focal-plane shutters.

## 4. Illustrations of different types—American.

## 5. Rectification (different types—American).

## 6. Mounts.

## 7. View finders.

## 8. Overlap regulator.

## 9. Automatic recording.

## 10. Device for flattening the film.

## CHAPTER IV—INTERPRETATION OF AERIAL PHOTOGRAPHS

## 1. General Discussion:

Best methods of procedure.

## 2. Tone:

Reflection of light from different surfaces.

## 3. Light and shadows.

## 4. Natural features:

Relief, streams, bodies of water, woods, cultivation, etc.

## 5. Man made features:

Roads, trails, railroads, buildings, bridges, fences, etc.

## 6. Military features:

Trenches, shelters, artillery, tank obstacles, etc.

## CHAPTER V—AERIAL PHOTOGRAPHY

MOSAIC FLYING (Civil Companies)

MAPPING AND RECONNAISSANCE (Army)

FOR HYDROGRAPHIC SURVEYS (Navy)

All to cover practically the same subjects but in their own typical method.

## 1. Planning:

Desired scale, type of camera, flight lines, specification, etc.

## 2. Photographic Airplanes:

Type to do certain missions, accessories necessary for navigational aids, etc.

## 3. Determination of altitude:

Giving formulas and rule of thumb methods.

## 4. Use of oxygen if necessary.

## 5. Temperatures at high altitudes.

## 6. Emulsions and filters.

## 7. Flying:

Good technique for pilot and photographer to follow.

## 8. Developing and fixing aerial film.

## 9. Drying of film.

## 10. Printing and fixing the photographs.

Selection of the proper paper, types of printers, chemicals to be used, tables of specified quantities, etc.

## CHAPTER VI—GENERAL DISCUSSION

## 1. General Discussion:

Uses and limitations.

## 2. Effects of relief.

## 3. Effects of tilt.

## 4. Effects of photographic errors.

## 5. Effects of crab.

## 6. Importance of principal point, plumb point, and isocenter.

7. How to locate the above points.
8. Why the principal point may be used for certain types of compilation.
9. Necessity of 60 per cent overlap.
10. Errors in the radial assumption.
11. Brief resume of different compilation methods.
12. Summary:

To impress on the readers the irregularities in scale.

#### CHAPTER VII—STEREOSCOPY

1. General Discussion.
2. Monocular vision.
3. Binocular vision.
4. Phenomena of stereoscopic vision.
5. Suggestive hints for eye practices.
6. Absolute parallax.
7. Differential parallax.
8. Stereoscopes.
9. Floating marks.
10. Parallax equation.
11. The practical procedure for examination of stereoscopic pair of prints.
12. Errors in the stereoscopic model.
13. Anaglyph.

#### CHAPTER VIII—GROUND CONTROL

1. General Summation of:
  - Tilt, scale, relief and photographic errors and the importance of accurate ground control to overcome the irregularities in scale.
2. Best features to locate.
3. Methods that may be used to tie these features to the main triangulation net.
4. How to spot these features on the photographs.
5. Importance of good clear sketches so that the ground features may be used in the future by other mapping agencies.
6. Vertical control by:
  - Levels.
  - Trigonometric method
  - Barometer.

#### CHAPTER IX—FIELD INSPECTION

1. General Discussion.
2. Classification of roads and culture.
3. Checking the compilation.
4. Collecting names.
5. etc.

#### CHAPTER X—VERTICAL MAPPING PROCEDURE

##### OVERLAY METHOD (Planimetric Detail)

1. General Discussion.
2. Method of transferring the ground control points.
3. Location of principal points and transfer of these points to the preceding and succeeding photographs.
4. Selection of photo control.
5. Drawing radial lines.
6. Determination of average scale of photographs.
7. Laying out projection and plotting ground control.
8. Photo control extending between ground control.
9. Breaking up the area suitable to plotting detail.
10. Transfer of detail from photograph to compilation sheets.

##### HAND TEMPLET METHOD (Planimetric Detail)

1. General Discussion.
2. Method of transferring the ground control points.
3. Location of principal points and transfer of these points to the preceding and succeeding photographs.
4. Selection of photo control.
5. Location of control (ground and photo) points on templets.

6. Ruling the templets.
  7. Determination of average scale of photographs.
  8. Laying out projection and plotting ground control.
  9. Laying the templets.
  10. Breaking up the area suitable to plotting detail.
  11. Transfer of detail from photograph to compilation sheets.
- SLOT TEMPLET METHOD (Planimetric Detail)**
1. General Discussion.
  2. Method of transferring the ground control points.
  3. Location of principal points and transfer of these points to the preceding and succeeding photographs.
  4. Selection of photo control.
  5. Location of control (ground and photo) points on templets.
  6. Cutting the templets.
  7. Laying out projection and plotting ground control.
  8. Laying templets.
  9. Breaking up the area suitable to plotting detail.
  10. Transfer of detail from photographs to detail sheets.
- U.S.G.S. SPIDER METHOD (Planimetric Detail)**
1. General Discussion.
  2. Method of transferring the ground control points.
  3. Location of principal points and transfer of these points to the preceding and succeeding photographs.
  4. Selection of photo control.
  5. Adjusting spider arms to control points.
  6. Laying out projection, and plotting ground control.
  7. Laying the spiders.
  8. Breaking up the area suitable to plotting detail.
  9. Transfer of detail from photographs to detail sheet.
- MULTIPLEX (Contours and Planimetric Detail)**
1. General Discussion.
  2. Complete information on equipment.
  3. Printing of diapositives.
  4. Method of projection.
  5. Method of measuring differences of elevations.
  6. Step by step procedure of setting and adjusting the spacial models to the plotted control points.
  7. Step by step procedure in delineating planimetric detail.
  8. Step by step procedure in contouring.
- STEREOPLANIGRAPH**
- STEREO COMPARAGRAPH METHOD (Contours and Planimetric Detail)**
1. General Discussion.
  2. Complete information on equipment.
  3. Statement as to how the horizontal control is obtained.
  4. Step by step procedure in obtaining planimetric detail.
  5. Measurement of stereoscopic parallax.
  6. Measuring system of this instrument.
  7. Parallax tables:
    - Basis of computation.
    - Use of parallax tables.
  8. Spot elevations for contouring.
  9. Graph construction.
  10. Step by step procedure for contouring.
  11. Compiling the stereo-sketches.
- BROCK METHOD (Contours and Planimetric Detail)**
1. General Discussion.
  2. Description of equipment.
  3. Complete information on procedure.
- ANALYTICAL METHOD (To Obtain Necessary Control for Plotting Detail)**
1. General Discussion.
  2. Space Resection.
  3. Extension of control.
- EUROPEAN METHODS (Contours and Planimetric Detail)**
1. General Discussion.

## 2. Comparative Summary:

Between European methods and American methods based on results that have been deduced from the work of others.

## CHAPTER XI—OTHER USES FOR VERTICAL PHOTOGRAPHS

## 1. General Discussion.

## 2. As used by A.A.A.

Ratio prints, scale check problem, field uses of ratioed prints, etc.

## 3. Forest Service.

## CHAPTER XII—OBLIQUE MAPPING

## CANADIAN GRID SYSTEM

## 1. General Discussion.

## 2. Development of the perspective grid.

## 3. Differences between the visible and true horizon.

## 4. Step by step procedure in constructing the grid.

## 5. Suitable illustrations and a specific problem.

## PERSPECTIVE GRIDS FOR LOW OBLIQUES

## 1. General Discussion.

## 2. The development of the perspective grid.

## 3. Principles of the Four-Point-Method.

## 4. The transfer of directional rays.

## 5. Step by step procedure in constructing the grid for low obliques.

## 6. Suitable illustrations and a specific problem.

## MILLER METHOD

## 1. General Discussion.

## 2. Geometry of high obliques leading up to the necessary computations.

## 3. Type of photographs, how taken, altitude, etc.

## 4. Derivation of the necessary formulas.

## 5. Discussion of the principles of the Single-Eyepiece plotter.

## 6. Step by step procedure in plotting detail from obliques.

## 7. Step by step procedure in plotting "spot heights."

## PHOTO ALIDADE

## 1. General Discussion.

## 2. Description of the instrument.

## 3. Complete discussion of the necessary formulas.

## 4. Step by step procedure in setting the photographs in the instrument and delineation of information from photographs.

## CHAPTER XIII—MOSAICS

## CONTROLLED

## 1. General Discussion.

## 2. Preparation for laying the mosaic.

## 3. Necessary material.

## 4. Control and computations to restitute the individual photographs.

## 5. Restitution printers.

## 6. Formula for mixing gum arabic.

## 7. Step by step assembly of the mosaic.

## 8. Checking the scale of completed mosaic.

## 9. Reproducing the mosaic.

## UNCONTROLLED MOSAIC

## 1. General Discussion.

## 2. Reliability.

## 3. Step by step procedure of laying mosaic.

## CHAPTER XIV—PRACTICAL WORKING PROBLEMS

## CHAPTER XV—MAP PROJECTIONS

## CHAPTER XVI—NOMENCLATURE