WAR DEPARTMENT

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ARMY EXTENSION COURSES

EXTENSION COURSE

OF

THE AIR CORPS SCHOOLS

SUBCOURSE 20–6, AERIAL PHOTOGRAPHY AND INTERPRETATION OF AERIAL PHOTOGRAPHS

1938–39

(INTRODUCTION AND LESSON 1)

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON: 1938

WAR DEPARTMENT,
WASHINGTON, *June 30, 1938.*

The following Subcourse 20–6, Aerial Photography and Interpretation of Aerial Photographs, Extension Course of the Air Corps Schools, Army Extension Courses, 1938–39, Lessons 1 to 6 inclusive, and examination, is published for the information and guidance of all concerned.

[A. G. 352.6 (2–15–38).]

BY ORDER OF THE SECRETARY OF WAR:

MALIN CRAIG,
Chief of Staff.

OFFICIAL:
E. S. ADAMS,
Major General,
The Adjutant General.

ARMY EXTENSION COURSES

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SUBCOURSE 20–6, AERIAL PHOTOGRAPHY AND INTERPRETATION OF AERIAL PHOTOGRAPHS

INTRODUCTION

Purpose and scope.

The purpose of this subcourse is to give the student a knowledge of the types of aerial cameras used in the Air Corps; the general principles involved in the taking of aerial photographs; and the possibilities and limitations of aerial photography.

The scope of this subcourse is: Photography and its application in the Air Corps; use of photography in camouflage; plotting and mapping the area covered by a photograph.

The lesson titles are as follows:

Lesson 1—Aerial Cameras and Accessories.
2—Film Development, Oblique and Vertical Aerial Photography.
3—Ground Area and Scale of Vertical Photographs.
4—Mosaics.
5—Restitutional Printing, Transformation Printing, and Aerial Stereophotography.
6—Interpretation of Aerial Photographs.

Number of lessons and approximate time required.

This subcourse consists of 6 lessons and an examination and will probably require approximately 15 hours of work by the average student.

The time listed for the subcourse and for each lesson and the examination is only an estimate and should be considered merely as a guide. It does not in any way limit the time that may be devoted to lesson, examination, or subcourse.

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Texts required.

TR 210–10, Military Intelligence, Tactical Interpretation of Aerial Photographs, January 4, 1926.

TM 2170–6, Aerial Photography.

Materials required.

Combined Protractor and Scales (paper), Army Extension Courses.

Special instructions and information.

This subcourse was prepared by the Air Corps Technical School under the direction of the Chief of the Air Corps.

EXTENSION COURSE
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LESSON ASSIGNMENT SHEET

SUBCOURSE 20–6 —Aerial Photography and Interpretation of Aerial Photographs.
LESSON 1 —Aerial Cameras and Accessories.
ESTIMATED TIME —2 hours.
TEXT ASSIGNMENT —TM 2170–6, paragraphs 3 to 10*h*, inclusive.
MATERIALS REQUIRED—None.
MAXIMUM WEIGHT —100.
SUGGESTIONS —None.
EXERCISE

Weight

6 1. *a.* What is the principal difference between K-type and T-type cameras?

4 *b.* Give four examples of K-type cameras.

7 2. *a.* In vertical photography what provisions are made to maintain the camera level and its sides parallel to the line of flight?

3 *b.* If the evidence on a K-type camera showed it to be level and yet the finished photograph showed tilt, what was the cause?

5 3. How can one determine the amount of shrinkage in aerial film?

6 4. *a.* Name two sources of power by which the K-type cameras may be operated.

4 *b.* What source of power is used in operating the T-type cameras?

5 5. By what means are the pilot and observer informed that an exposure is about to be made by an electrically operated camera?

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SOLUTIONS

SUBCOURSE 20–6—Aerial Photography and Interpretation of Aerial Photographs.

LESSON 1 —Aerial Cameras and Accessories.

Weight

6 1. *a.* The principal difference between K-type and T-type cameras is that the K-type is a single lens while the T-type is a multiple lens camera. (Par. 3.)

4 *b.* K–3B (Par. 5), K–10 (Par. 8), K–7C (Par. 7) and K–12 (Par. 9).

7 2. *a.* The camera mount is so constructed as to permit the camera to be tilted or turned in any direction required. (Par. 4 *a.*)

3 *b.* The airplane was turning, creating a centrifugal force which displaced the level bubble. (Par. 4 *a.*)

5 3. The glass plate in the magazine over which film passes is etched with accurately located lines which will photograph on the film. (Par. 5 *d.*)

6 4. *a.* Any 12-volt storage battery; or manually operated. (Par. 5 *a* and *g.*)

4 *b.* Film is wound manually while shutters are operated by an electric shutter control unit. (Par. 10 *a.*)

5 5. By pilot's and observer's signal lights which flash a 3-second warning before the tripping of the shutter. (Par. 5 *i.*)

10 6. Between-the-lens type—K–7C (Par. 7 *c*); K–12 (Par. 9 *a* (2)); K–3B and T–3A. (Par. 3.)

Focal-plane type—K–10. (Par. 3.)

7 7. *a.* (1) Neutralization of the vibration of the aircraft from which pictures are taken. (Par. 4 *a.*)

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Weight

(2) To permit the camera to be held in a vertical position regardless of the tilt of the airplane. (Par. 5 *f*.)

(3) To permit the camera to be turned to compensate for "crabbing" of the airplane. (Par. 5 *f*.)

(4) To hold the camera securely in position in the plane. (Deduced.)

b. To hold the camera when not in use. (Par. 8 *d*.)

8. The K–3B camera. The magazines for the K–3B camera are removable and interchangeable with any camera of this type, therefore permitting the taking of as many magazines on a flight as may be needed (par. 5 *d*); while with the T–3A camera the magazines are built into the camera and must be loaded in the darkroom. (Par. 10 *h* (1).)

9. A light trap operated by the shutter release lever is located behind the lens preventing exposure of the film while the shutter is being rewound. (Par. 8 *c* (4).)

10. To avoid changes, due to weather, in length of a wooden core and to assist the device in the magazine which regulates the even spacing between exposures. (Par. 5 *e*.)

11. *a*. The K–7C camera covers over twice the area covered by the K–3B with its corresponding focal length. (Par. 7 *a*.)

b. Because of its faster lens, the K–12 camera may be used under a little more adverse light conditions than the K–3B. (Par. 9 *a*.)

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Weight

10 6. Name two types of shutters employed in aerial cameras and name one camera employing each.

7 7. *a*. Give three purposes accomplished in aerial photography by the A–8 camera mount.

3 *b*. What is the main purpose of the A–7 mount?

10 8. On a given flight, with which camera can more exposures be made, a K–3B camera, or a T–3A camera? Why?

10 9. When the shutter of the K–10 camera is rewound preliminary to the next exposure, why doesn't a double exposure result?

10 10. Why is it advisable to use an aluminum take-up spool in the K–3B magazines?

5 11. *a*. What is the advantage of the K–7C camera over the K–3B camera of the same focal length?

5 *b*. What advantage has the K–12 camera over the K–3B equipped with a cone of similar focal length?

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SUBCOURSE 20–6—Aerial Photography and Interpretation of Aerial Photographs.

LESSON 3 —Ground Area and Scale of Vertical Photographs.

Weight

20 1. 1/17,454.5 or 1/17,455. (Par. 23.)

30 2. 18 exposures. (Par. 26.)

Detailed calculations for Solution 2.

Fl.: Alt. :: d : D

12 : 8000 ft. :: 7 : x

12x=56,000 ft.

x=4,666⅔ ft.

∴ each exposure covers 4,666⅔ ft. in a longitudinal direction.

Fl.: Alt. :: d : D

12 : 8000 ft. :: 9 : x

12x=72,000 ft.

x=6,000 ft.

∴ each exposure covers 6,000 ft. laterally.

60%=Longitudinal overlap.

60% of 4,666 ft.=2,799.6 ft.

50%=Lateral overlap.

50% of 6,000 ft.=3,000 ft.

∴ each exposure advances the plane 1,866.4 ft., and each exposure covers 3,000 ft. laterally.

4 in. by 5½ in.=area outlined on map.

1/24,000=map scale.

∴ 1 in. on the map=24,000 in. on the ground.

12 in.=1 ft.

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Weight

We arrive at the formula—

Units on the map x reciprocal of scale=Ground distance, therefore: $\frac{4\times24{,}000}{12}$=Ground distance in feet.

$\frac{4\times24{,}000}{12}$=8,000 or 8,000 ft.

∴ the width of the area to be photographed is 8,000 ft.

$\frac{5\frac{1}{2}\times24{,}000}{12}$=11,000 ∴ 11,000 ft.

∴ the length of the area to be photographed is 11,000 ft.

11,000 ft.=length of area.

1,866 ft.=advance of plane per exposure.

11,000 ft.=11,000÷1,866=5+ ∴ 6 exposures.

∴ 6 exposures per strip are necessary.

8,000 ft.=width of the job.

3,000 ft.=width of each exposure.

8,000 ft.÷3,000=2+ ∴ 3 exposures or strips.

∴ 3 strips are necessary to cover the job.

1 strip=6 exposures.

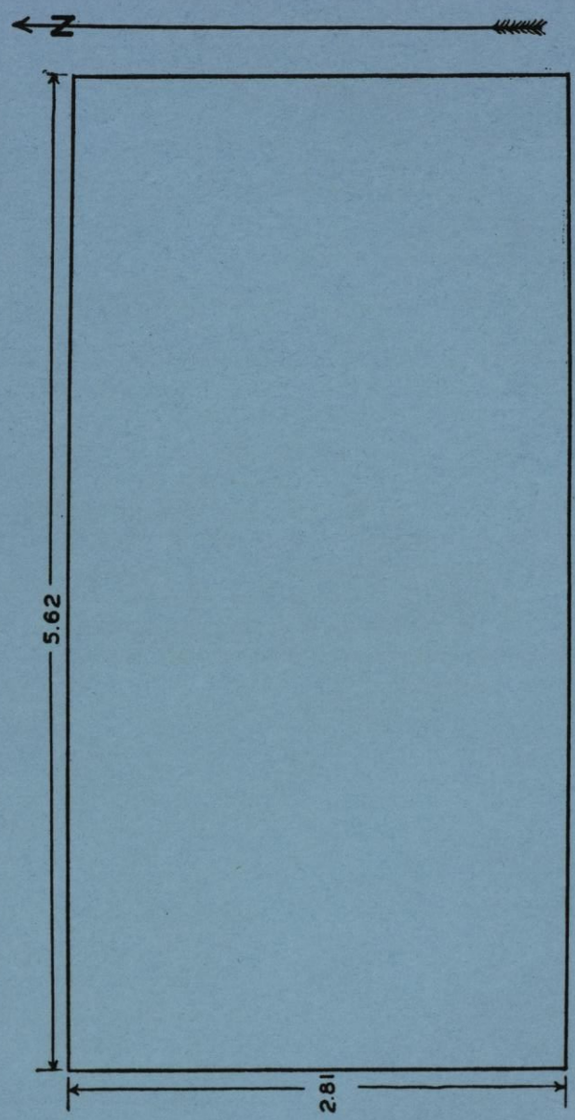
3 strips=3×6 exposures or 18 exposures.

∴ 18 exposures are necessary to complete the job.

3. See diagram on next page. (Par. 22.)

4. *a*. 14,000 feet. (Par. 26.)

b. 1 inch=.11 mile. (Par. 26.)



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LESSON ASSIGNMENT SHEET

SUBCOURSE 20–6 —Aerial Photography and Interpretation of Aerial Photographs.

LESSON 3 —Ground Area and Scale of Vertical Photographs.

ESTIMATED TIME —2 hours.

TEXT ASSIGNMENT —TM 2170–6, paragraphs 22 to 27, inclusive.

MATERIALS REQUIRED—Situation map herewith.
Combined Protractor and Scales (paper), Army Extension Courses.
Tracing paper herewith.

MAXIMUM WEIGHT —100.

SUGGESTIONS —None.

EXERCISE

Weight

20 1. What is the scale in representative fraction of a photograph taken from 12,000 feet with an 8¼-inch K–3B camera?

30 2. How many exposures will be necessary to make a mosaic of the area (A) outlined on the situation map if flown at an altitude of 8,000 feet using a 12-inch K–3B camera, using 60 percent overlap of exposures and 50 percent overlap of strips, flying the strips the long way of the area. Assume the nearest inch measurements as the dimensions of the film and that all territory must be overlapped in the strip.

25 3. Using point X on situation map as a pinpoint, outline on tracing paper the area covered by one exposure from 15,000 feet by a K–7C camera. Assume the nearest inch dimensions as the dimensions of the film. Have the long dimension of the film parallel to east–west line.

15 4. *a.* At what elevation will it be necessary to fly with a 24-inch K–3B camera to cover exactly the width of the strip (B) outlined on situation map?

10 *b.* What will be the scale in miles per inch? (Carry figures two places).

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LESSON ASSIGNMENT SHEET

SUBCOURSE 20–6 —Aerial Photography and Interpretation of Aerial Photographs.
LESSON 4 —Mosaics.
ESTIMATED TIME —2 hours.
TEXT ASSIGNMENT —TM 2170–6, paragraphs 30 to 49, inclusive.
MATERIALS REQUIRED—Situation map herewith.
Combined Protractor and Scales (paper), Army Extension Courses.
Tracing paper herewith.
MAXIMUM WEIGHT —100.
SUGGESTIONS —None.
EXERCISE

Weight	
5	1. *a.* What is a photographic reconnaissance strip?
5	*b.* What is a photographic mosaic?
5	2. *a.* What overlap of prints is desirable in the strip?
5	*b.* What overlap of strips is desirable in a mosaic?
10	3. Give three reasons why mosaics may be of particular value in time of war.
10	4. Presuming that a suitable map on which to mark flight lines is not available, what preparations would you make for a flight guide to make a mosaic of an area requiring several strips?
5	5. *a.* What time of day is ordinarily best for flying mosaics?
5	*b.* Why?
5	6. *a.* Why are photographs made with the multilens camera ordinarily unsuitable for military intelligence work?
5	*b.* Why are multilens photographs particularly suitable for map making?

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Weight

30 7. On tracing paper, plot the flight lines for the area outlined on the situation map. Plot flight lines in an east-west direction, assuming the use of a 12-inch K–3B camera to make a map 6.33 inches to the mile. Assume customary overlap of strips. Remember the outer strips should overlap the edge of the area by at least 20 percent of the width of a strip.

5 8. *a*. What type of projection is used in placing the control data on the mounting board preliminary to laying down a mosaic?

5 *b*. What Government publications furnish the data necessary for the construction of this control net?

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SOLUTIONS

SUBCOURSE 20–6—Aerial Photography and Interpretation of Aerial Photographs.

LESSON 4 —Mosaics.

Weight

5 1. *a.* A reconnaissance strip is a series of overlapping vertical photographs taken in a single strip. (Par. 30 *c.*)

5 *b.* A mosaic is composed of two or more reconnaissance strips whose sides overlap. (Par. 30 *a.*)

5 2. *a.* 60 percent. (Par. 35.)

5 *b.* 50 percent. (Par. 35.)

10 3. They give maps more quickly than any other means; they often give the only maps possible to obtain; they supply more details of military importance than any other type of map obtainable. (Par. 30 *b*, and "deduced".)

10 4. Look the territory over from the air, make a rough sketch, and make reconnaissance strips on three sides of the area on which to plot the starting and finishing points. (Par. 32 *b.*)

5 5. *a.* Between 10:00 AM and 3:30 PM. (Par. 33 *c.*)

5 *b.* Light conditions are best at this time and the shadows obscure detail least. (Par. 33 *c.*)

5 6. *a.* They fail to show much detail of military value due to distortion if taken from low altitudes, and due to small scale if taken from high altitudes. (Par. 34.)

5 *b.* The large amount of territory covered by each exposure speeds up production and, because of the large number of control points appearing in each picture, the work can be done accurately. (Par. 34.)

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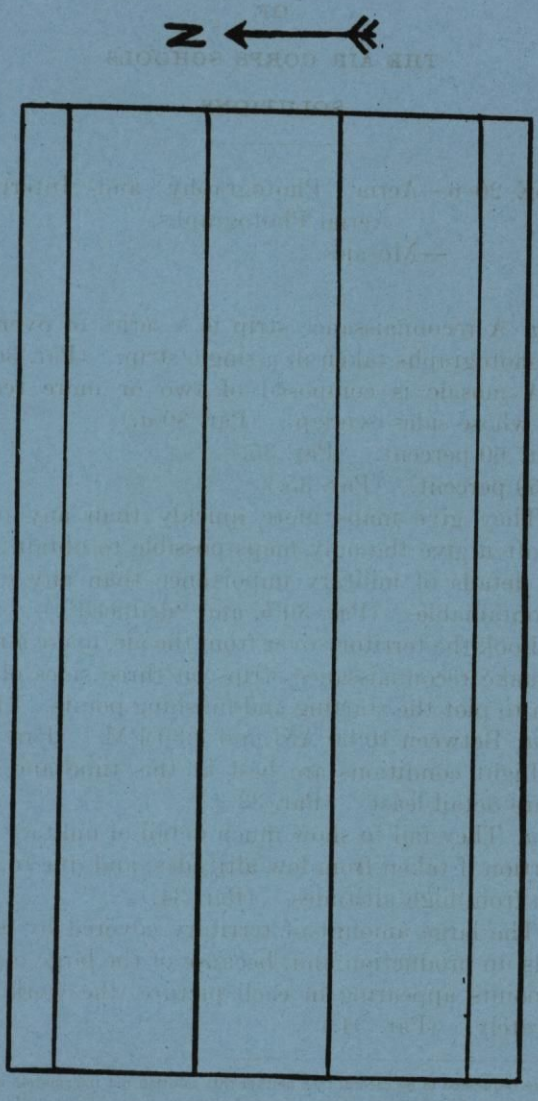
Weight

30 7. See diagram below. (Pars. 35 and 36.)

5 8. *a*. Polyconic projection. (Par. 42 *a* (2).)

5 *b*. Bulletin No. 650, United States Geological Survey, and Special Publication No. 5, United States Coast and Geodetic Survey. (Par. 42 *a* (2).)



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LESSON ASSIGNMENT SHEET

SUBCOURSE 20–6 —Aerial Photography and Interpretation of Aerial Photographs.

LESSON 5 —Restitutional Printing, Transformation Printing, and Aerial Stereophotography.

ESTIMATED TIME —2 hours.

TEXT ASSIGNMENT —TM 2170–6, paragraphs 50, 51, and 55 to 67, inclusive.

MATERIALS REQUIRED—None.

MAXIMUM WEIGHT —100.

SUGGESTIONS —None.

EXERCISE

Weight	
10	1. Define restitution as applied to aerial photography.
10	2. What two main purposes are served by the B–3 printer?
10	3. How is the paper held in the correct focal-plane in the case of the B–7 printer?
15	4. Having correctly mounted a roll of film on the B–7 printer, describe the steps used in adjusting the film preparatory to making an exposure.
5	5. What is an anaglyphoscope?
10	6. What is the purpose of stereophotography?
10	7. What two general types of stereoscopes are in use in the Air Corps and on what general principle of construction do they differ?
5	8. What is the maximum distance from the camera at which the normal interpupillary separation will give satisfactory relief?
10	9. In making aerial stereophotographs how does the increasing or decreasing of time between exposures affect the amount of visual relief?
15	10. In order to obtain satisfactory relief, what ground distance should be covered in feet between exposures using a 12-inch K–3B camera at an altitude of 15,000 feet? Show work.

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SOLUTIONS

SUBCOURSE 20–6—Aerial Photography and Interpretation of Aerial Photographs.

LESSON 5 —Restitutional Printing, Transformation Printing, and Aerial Stereophotography.

Weight

10 1. As applied to aerial photography, restitution is the correction of errors in scale which may be determined to be present in an aerial negative. (Par. 50.)

10 2. It acts as a reducing and enlarging printer and also corrects for errors in scale due to tilting of the camera or variations in elevation of the ground. (Par. 55 *c*, *d*, and *e*.)

10 3. By suction applied through holes in the back against which the paper is placed. (Par. 59 *b* (4).)

15 4. Wind the film until the collimating notches on the first negative come into position opposite the etched lines on the glass plate. Close the glass door, turn on the light in the interior of the printer, and then, with the aid of the magnifiers, very carefully adjust the notches on the film over the etched lines on the glass plate. (Par. 62 *a*.)

5 5. A pair of spectacles with one red glass and one blue. (Par. 67 *f*.)

10 6. To obtain a sense of relief in views which would otherwise appear perfectly flat. (Par. 64 *b*.)

10 7. The hand held type and the table type. The hand type uses lenses in viewing the photos and requires specially mounted photographs, while the table type views the images by reflecting mirrors and requires no special mounting for the pictures. (Par. 66 *b*.)

5 8. 50 yards. (Par. 67 *b* (2).)

10 9. The greater the overlap of successive photographs the less the relief will be noticeable when viewed through the stereoscope. (Par. 67 *b* (4).)

15 10. 3,150 ft. $\frac{2.52 \times 15{,}000}{12} = 3{,}150$. ∴3,150 ft. (Par. 67*b* (3).)

All concerned are requested to be careful that neither this solution nor information concerning the same comes into the possession of students or prospective students who have not completed the work to which it pertains.

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LESSON ASSIGNMENT SHEET

SUBCOURSE 20–6 —Aerial Photography and Interpretation of Aerial Photographs.
EXAMINATION —
ESTIMATED TIME —3 hours.
TEXT ASSIGNMENT —Any text previously used.
MATERIALS REQUIRED—Situation map herewith.
Combined Protractor and Scales (paper), Army Extension Courses.
Tracing paper herewith.
MAXIMUM WEIGHT —100.
SUGGESTIONS —None.
EXERCISE

Weight

5 1. What methods are used in Air Corps aerial cameras for keeping the film in the focal plane?

5 2. What is the prime essential with regard to the relations of pilot and photographer for obtaining the best results in oblique aerial photography?

5 3. For what purpose was the K–12 camera designed?

4. Hostilities have broken out between the Red and Blue forces and the Blue forces occupy the east bank of the Wisconsin River in force. The Red troops, of which you are a member, have no satisfactory maps of the area east of the Wisconsin River.

a. It is desired to obtain a topographical map as quickly as possible of the area (situation map) east of the line through Mosinee, Rib Hill, and Merrill. The Red airdrome is 50 miles west of Wausau. A plane with a cruising speed of 120 miles an hour and a satisfactory operating ceiling of 22,000 feet is available; the orders are to fly the plane at 20,000 feet. The visibility is average and the sky is clear and unlimited.

6 (1) What standard Air Corps camera should be used on the mission?

6 (2) What will be the scale in miles per inch of the resulting contact prints?

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Weight

5 (3) If all territory must be covered by both longitudinal and lateral overlap of the usual percentage, approximately how long, after gaining the required altitude and determining the necessary crab, will it take actually to photograph the area?

6 (4) How many exposures would be required?

6 (5) On tracing paper plot flight lines for the area.

6 (6) What filter would be used?

b. Enemy Reserves are reported concentrating in the vicinity of Hogarty (area "A" on situation map) so it is desired to map this area for a more detailed study. No hostile antiaircraft artillery is expected to be encountered but 50 caliber antiaircraft defense should be expected. The ceiling is limited by a solid but not dense overcast at 15,000. Haze extending as high as 25° is apparent on the ground. Enemy aircraft are not active. Pictures at a scale of approximately 1/10,000 are desired.

5 (1) What camera would be used?

5 (2) What filter would be used?

5 (3) How many exposures should be necessary? (Consider that all territory must be overlapped side and end).

c. An attack is anticipated on the Red strong points in the vicinity of Rib Hill, so constant photographic surveillance of the area "B" outlined on situation map is desired. Enemy antiaircraft artillery fire may be expected, making it dangerous to fly below 17,000; and enemy aircraft are active. Ceiling is unlimited.

5 (1) What camera would you use to photograph a reconnaissance strip at a scale of 1/9,000?

5 (2) How many strips would be necessary to cover the area?

d. It is desired to obtain vertical pinpoints of certain road intersections south and east of Wausau as early in the morning as possible.

5 (1) What camera would you use?

5 (2) If taken from 10,000 feet what would be the scale in representative fraction of the negatives?

10 5. In interpreting aerial photographs, which objects are difficult to identify without special knowledge, training, and experience?

5 6. What type of paper should be used in making prints for interpretation purposes? Why?

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SOLUTIONS

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LESSON 2 —Film Development, Oblique and Vertical Aerial Photography.

Weight

10 1. Must be developed in absolute darkness, therefore a safelight cannot be safely used. (Par. 11.)

10 2. *a.* Obtain an unobstructed view of the ground for a considerable distance and observe the degree of visibility. (Par. 19 *b.*)

b. (1) Aero 1 to K–3. (Par. 19 *b.*)

(2) Minus blue. (Par. 19 *b.*)

(3) Aero 1. (Par. 19 *b.*)

10 3. Perspective, balance, lighting, and background. (Par. 17.)

15 4. Point the camera as near the tail as possible without getting part of the tail in the picture; have the top of the view finder parallel to the horizon; have the camera pointing down enough so that a projection of its vertical axis will average a 30° angle below the horizon; center the objective laterally in the view finder and locate it vertically as demanded by good balance in that particular view. No part of the plane should show in the picture. (Par. 17, 18 *d*, and 19 *g.*)

15 5. Having decided upon the proper locality (with regard to light conditions and other factors peculiar to the subject) from which to make the view, the pilot should pass over a point in that locality at the proper elevation and distance from the objective to give the correct angle of camera deflection, and with the plane angled away from the objective enough so that the photographer can point the camera somewhat toward the tail in making the exposure. (Pars. 18 and 19 *g.*)

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Weight

6. Aero 1, Aero 2, K 3, Minus Blue, 25A. (Par. 19 *b*.)

7. Close objects move past at such a rapid rate that movement shows on the negative; the camera at right angles to the slip stream makes the camera difficult to hold steady, causing camera movement. (Par. 19 *f* (1) and *h*.)

8. Reconnaissance and map making. (Par. 21 *b*.)

9. Altitude to be flown; amount of film needed; scale at which pictures are to be taken; size of ground area covered by each exposure; filter to be used; be sure battery is fully charged; camera and accessories are properly installed; shutter of the camera is operating properly; the area to be photographed is located on a map or the location known by both pilot and photographer. (Par. 28.)

10. To show all of the details of military value possible in such a manner that they can be correctly interpreted.

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Photo by Air Corps, U. S. Army

Plate VII.

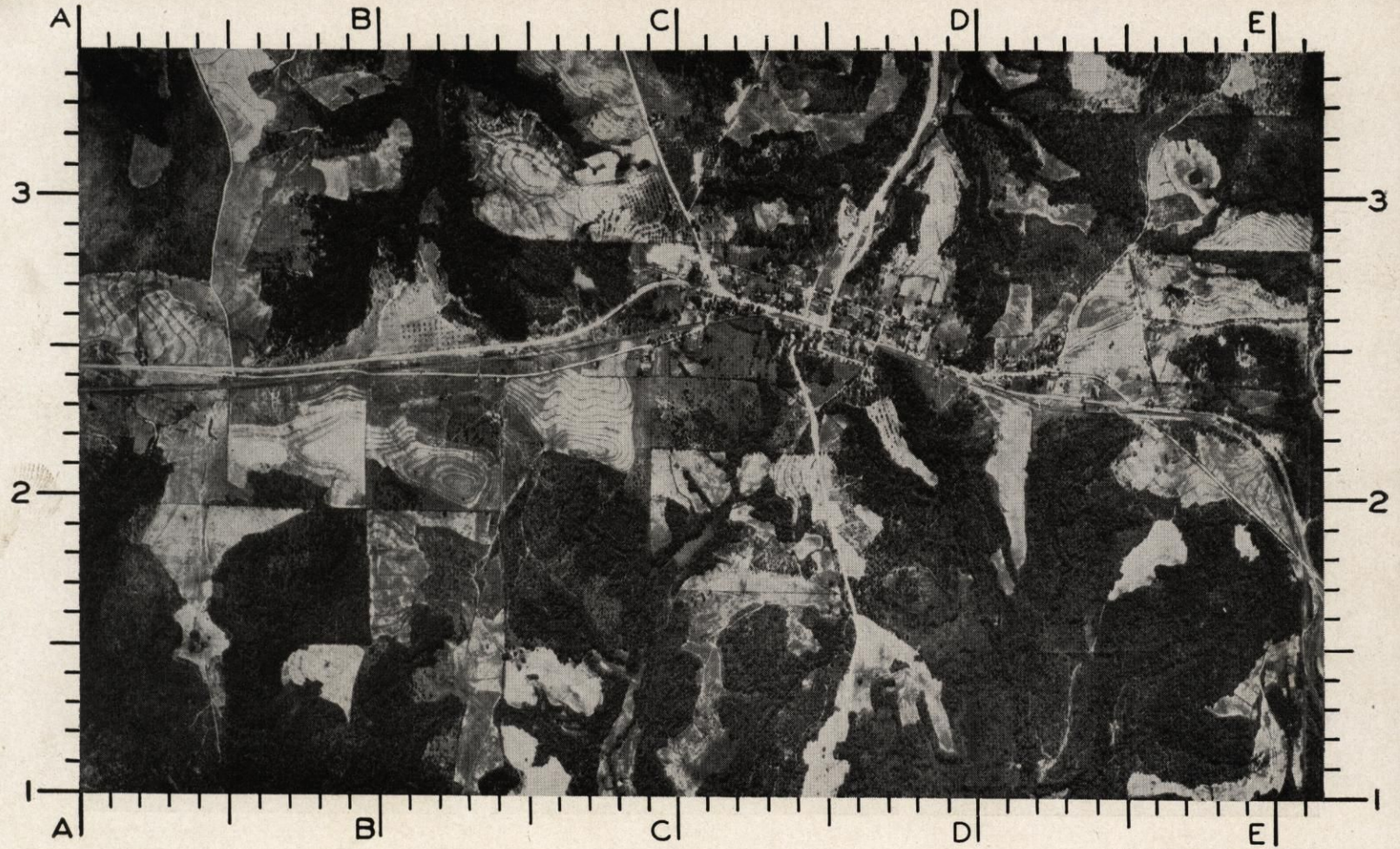


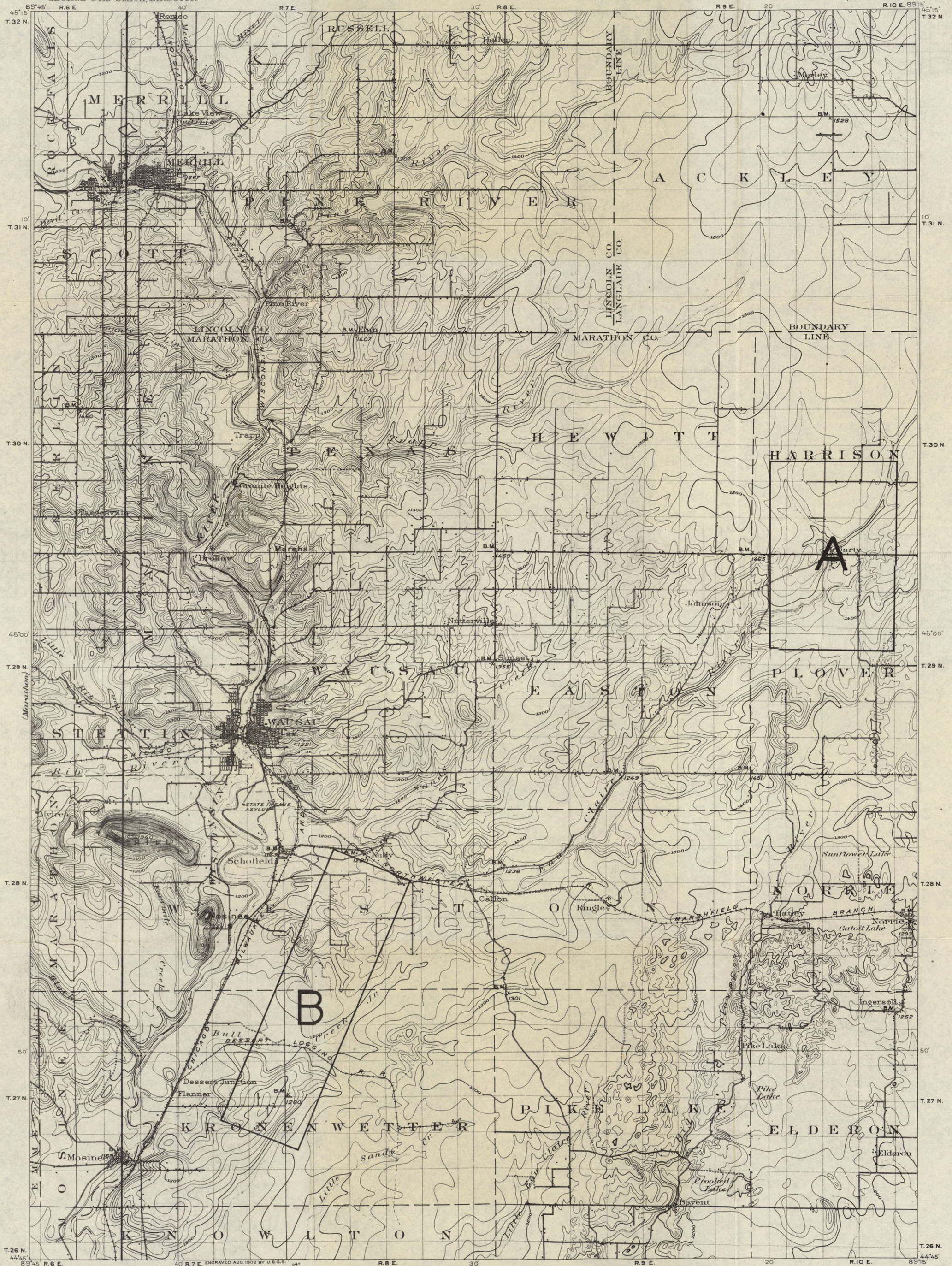
Plate VIII.

Photo by Air Corps, U. S. Army

DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, SECRETARY
U.S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

SITUATION MAP
TO ACCOMPANY
EXAMINATION, SUBCOURSE 20–6
EXTENSION COURSE OF THE AIR CORPS SCHOOL

WISCONSIN
WAUSAU QUADRANGLE



Jno. H. Renshawe, Geographer in charge.
Control by Geo. T. Hawkins.
Topography by Robert Muldrow.
Surveyed in 1899.

ENGRAVED AUG. 1902 BY U.S.G.S.

APPROXIMATE MEAN DECLINATION, 1902
TRUE NORTH
MAGNETIC NORTH

Scale 1/125000
1 ½ 0 1 2 3 4 5 Miles
1 ½ 0 1 2 3 4 5 Kilometers

Contour interval 20 feet.
Datum is mean sea level.

DIAGRAM OF TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Edition of 1902, reprinted 1920.

WAUSAU

SITUATION MAP
TO ACCOMPANY
LESSON 4, SUBCOURSE 20-6
EXTENSION COURSE OF THE AIR CORPS SCHOOL

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

ILLINOIS-INDIANA
DANVILLE QUADRANGLE

Jno. H. Renshawe, Geographer in charge.
Control by U.S. Lake Survey and Geo. T. Hawkins.
Topography by W.J. Lloyd.
Surveyed in 1897.

ENGRAVED JAN. 1899 BY U.S.G.S.

Scale 1/62500
1 0 1 2 3 4 Miles
1 0 1 2 3 4 5 Kilometers

Contour interval 10 feet.
Datum is mean sea level.

1930
Edition of Nov. 1900, reprinted 1938
Polyconic projection. North American datum

DANVILLE, ILL.-IND.

SITUATION MAP
TO ACCOMPANY
LESSON 3, SUBCOURSE 20-6
EXTENSION COURSE OF THE AIR CORPS SCHOOL

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

ILLINOIS-INDIANA
CALUMET LAKE QUADRANGLE

Mean elevation of lake surface in 1927,
579 feet above sea level

CHICAGO

Stony Island
Burnside
Pullman
Kensington
South Chicago
East Side
South Deering
Hegewisch
Burnham
Calumet City
Robertsdale
Water Garden
Hammond
Riverdale
Dolton

CALUMET LAKE
CALUMET RIVER
LAKE MICHIGAN
Calumet Harbor
BREAKWATER
TURNING BASIN
TRUMBULL PARK
CALUMET PARK
PULLMAN TRAINING SCHOOL
PALMER PARK
BOSTON PARK
Lake George

ILLINOIS
INDIANA
COOK CO
LAKE CO

T 38 N
T 37 N

2⅝ IN.

Scale 1/24000
1 0 1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Contour interval 5 feet
Datum is mean sea level

THROUGH ROUTES
SECONDARY ROUTES

1927

O.H. Nelson, Associate Topographic Engineer in charge
Topography by O.H. Nelson and W. E. Baird
Culture and drainage in part compiled from aerial photographs taken by Air Corps, U.S. Army
Control by U.S. Geological Survey, U.S. Lake Survey, City of Chicago, and from railroad valuation surveys
Surveyed in 1927

Polyconic projection. North American datum
5000 yard grid based upon U.S. zone system, C
Chicago City datum is 579.896 feet above mean sea level

CALUMET LAKE, ILL.-IND.
Edition of 1929