

Name: \_\_\_\_\_

FO-4313/6313 Spatial Technologies for Forest Resource Management  
Second Hour Exam, 2004

Formulas:

$$\frac{1}{S} = \frac{d}{D} = \frac{f}{(H-h)} \quad \frac{\Delta h}{(H-h)} = \frac{d}{r}$$
$$\frac{\Delta h}{(H-h)} = \frac{dp}{AP_b + dp} \quad \begin{matrix} dp = |X-X'| \\ AP_b = |Z-Z'| \end{matrix} \quad \tan \alpha = \frac{dh}{SL}$$

1. You are scheduling helicopter spraying in an area where a large tower is located and the pilot wants to know the tower height. Your photos have a nominal scale of 1:20,000 at the tower base that is located at 800 ft. above m.s.l. and were taken with a camera focal length of 152.4mm.

You can only find a **single, vertical photo**; the other photo of the stereo pair is lost in your truck or the dog ate it? The top of the tower is located 4.60 inches from the photo principal point. If the displaced tower image is 0.23 inches in length,

The computed tower height (**a.g.l.**) is \_\_\_\_\_ ft. (10)  
(What is tower height above the average ground level?)

2. You are using the parallax bar (floating dot) instrument on a **stereo pair** of photographs taken with a 76.2mm focal length to measure the height of a lookout tower. The photo scale is 1:16,000 at the base of the tower that is located at mean sea level. If the average distance between the principal and conjugate principal points on the stereo pair was 7.9989cm and the following parallax measurements were obtained:

Reading at top of object = 13.51 mm  
Reading at bottom of object = 9.30 mm

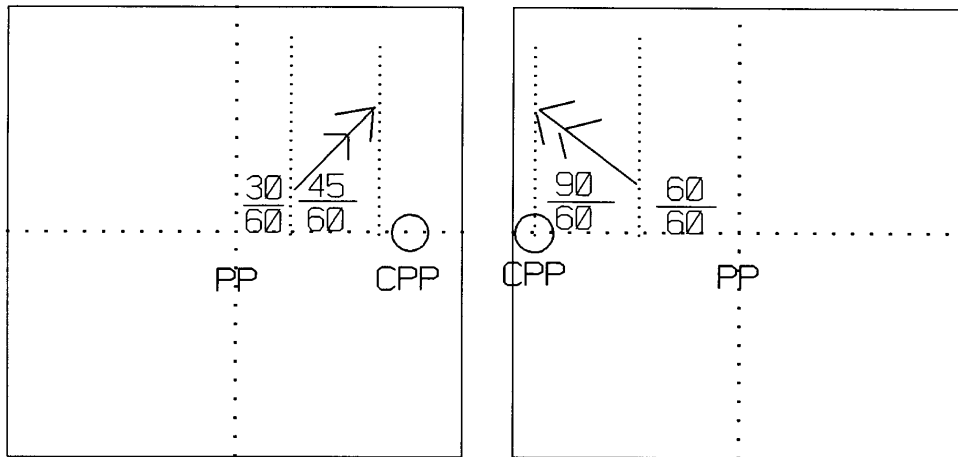
a. The altitude of the aircraft was: \_\_\_\_\_ ft. (5)

b. The height of the lookout tower is calculated to be \_\_\_\_\_ ft. (5)

3. A **stereo pair of vertical aerial photographs** was taken of a tower with a camera focal length of 76.2 mm; tilt was less than 3 degrees. The photo scale was 1:12,000 **at** the tower base which is located at 500 feet elevation. Using the stereo pair, you obtain the following parallax measurements:

Photo 1:	X-parallax to base of tower	= -60/60"
	X-parallax of tower image length	= -90/60"
Photo 2:	X-parallax to base of tower	= +30/60"
	X-parallax of tower image length	= +45/60"

The calculated height of the tower is: \_\_\_\_\_ ft. (10)



4. Explain the differences between latitudes/longitudes, the UTM and/or state plane coordinate system and the G.L.O. survey system: (9)

Latitudes/Longitudes: \_\_\_\_\_

UTM Coordinates: \_\_\_\_\_

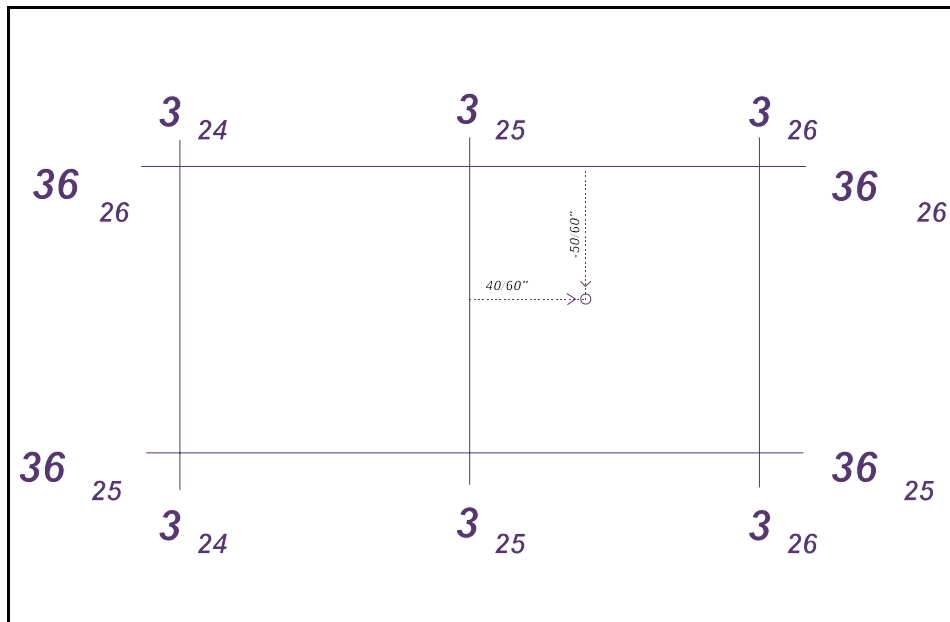
G.L.O. survey system: \_\_\_\_\_

5. You are planning to contract for stereo coverage (60% endlap) photography at a scale of 1:12,000 of an area with an average elevation of 280 ft.. If the contractor has an airplane that cruises at 160 knots per hour and an aerial camera with a 152.4mm focal length that uses a 9 by 9 inch film format, your calculations show:
- The acreage covered by one photo is \_\_\_\_\_ acres. (10)
  - In order to obtain 60% **endlap**, the distance between photo centers (on each flight line) should be \_\_\_\_\_ ft. (5)
  - In order to obtain a 20% photo (safety) **overhang** on the target area boundary, the first and last flight lines should be located \_\_\_\_\_ ft. inside the target area boundary. (5)
  - In order to obtain a 25% **sidelap**, interior flight lines (except for first and last) should be spaced a maximum of \_\_\_\_\_ ft. apart. (5)
7. With a GPS, an object can be described/recorded as a:  
 \_\_\_\_\_,  
 \_\_\_\_\_, or  
 \_\_\_\_\_ (6)
8. An ortho photograph is \_\_\_\_\_  
 \_\_\_\_\_ (5)
9. The UTM coordinate system is an artificial rectangular grid from a transverse mercator projection of a 6 degree slice of longitude.
- It is an “**artificial**” rectangular grid because \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (5)
  - Since a 6 degree slice of longitude is a “wedge” that begins and end at a pole, the rectangular coordinate for X is measured from \_\_\_\_\_ and the rectangular coordinate for Y is measured from \_\_\_\_\_ (6)

10. Refer to the sketch from a **7.5 minute quadrangle** below where the scale is **1:24,000**. If the measured distances are  $X=+40/60$  inch from the  $3_{25}$  grid line and  $-50/60$  inch from the  $36_{26}$  UTM grid lines to Control Point X, calculate the UTM coordinates of Control Point X. (give distance, unit of measure, direction)

a. Easting = \_\_\_\_\_ (3)

b. Northing = \_\_\_\_\_ (3)



11. Describe why or why not timber volumes can be estimated from aerial imagery with satisfactory precision (i.e. sampling error less than 10%). Support your choice!

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