Name: Key

FO-4313/6313 Spatial Technologies in Natural Resource Management
Second Hour Exam, 2007

Formulae:

1. $RF = \frac{1}{S} = \frac{d}{D} = \frac{f}{(H-h)}$ 2. $\frac{\delta h}{(H-h)} = \frac{d}{r}$ 3. $\frac{\delta h}{(H-h)} = \frac{dp}{AP_b + dp}$ $dp=|X-X'|$ $AP_b=|Z-Z'|$

1. Explain the differences/similarities between latitudes/longitudes, UTMs, and the G.L.O. survey system: (6)

Latitudes/Longitudes: true geographic location system for points on the earth's sphere.

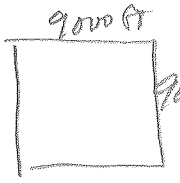
UTM Coordinates: artificial, rectangular grid system based on transverse mercator projection

G.L.O. survey system: an area partitioning system

2. 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:

1:12,000 → 1" = 1000 ft

a. The acreage covered by one photo is $\frac{(9000)^2}{43560} = 1,859.5$ acres. (10)



b. In order to obtain 60% **endlap**, the distance between photo centers (on each flight line) should be 3600 ft. (5)

$(.4)(9000) = 3600$

c. In order to obtain a 20% photo (safety) **overhang** outside the target area boundary, the first and last flight lines should be located 2,700 ft. inside the area boundary. (5)

$(.5-.2)(9000) = 2700$

d. In order to obtain a 25% **sidelap**, interior flight lines (except for first and last) should be spaced a maximum of 6750 ft. apart. (5)

$(.75)(9000) = 6750$

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3. On a single aerial image, a radial line is selected that passes over a coastal redwood tree whose base is located at 850 feet of elevation. What is the height of the tree if the photo scale is 1 inch equals 500 feet at the tree base elevation, the camera focal length is 6 inches, and the 60 scale on the engineer's scale is used to obtain the following measurements parallax measurements?

Nadir to base of tree = 241 increments
Nadir to top of tree = 255 increments

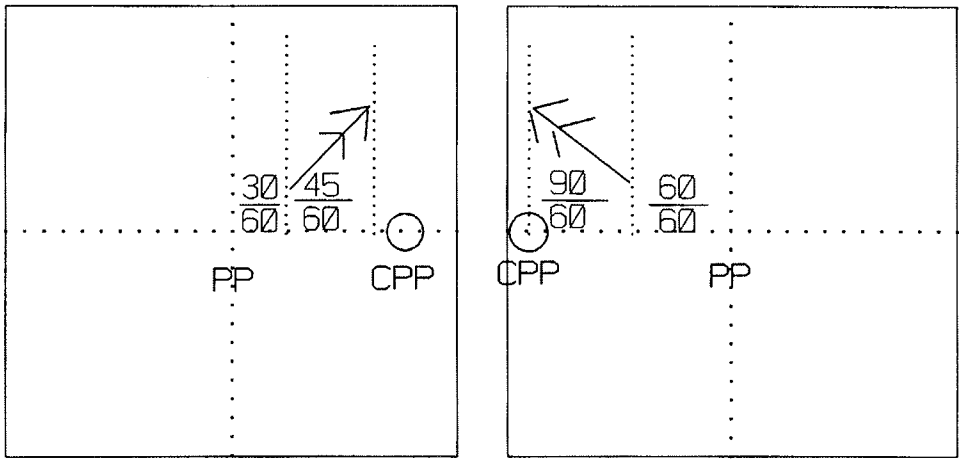
Height of tree = 1647 ft. (20)

4. 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 Z = -60/60"
X-parallax of tower image length X = -90/60"

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

The calculated height of the tower is: 1,800 ft. (20)



5. Using the parallax bar (floating dot) instrument on a stereo pair where the flying height was 3,000 ft above average terrain elevation and the average distance between the PP and CPP was 0.24606 feet, the following parallax measurements were obtained:

Reading at top of object = 12.76 mm
Reading at bottom of object = 10.00 mm

The height of the object is 106 ft.

$\frac{\Delta h}{3000} = \frac{2.76\,mm}{0.24606\,ft + 2.67\,mm}$

$\frac{\Delta h}{3000} = \frac{2.76\,mm}{75 + 2.67\,mm}$ (15)

$\Delta h = 106.8\,ft$

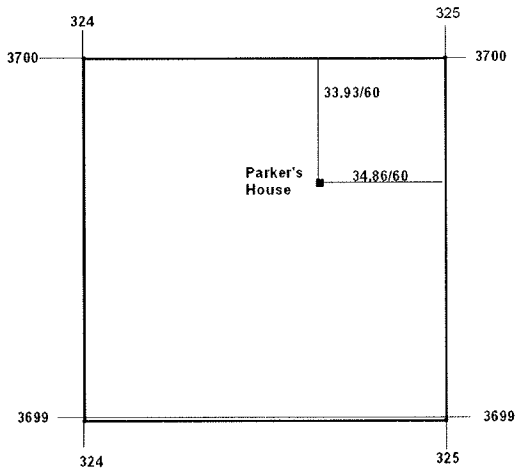
6. An F-16 jet has just departed Atlanta, GA to drop a 500 lb smart bomb on Dr. Parker's house. Based on a portion of the NAD27 Longview 7.5' quad sheet (RF = 1:24,000) below, the Zone 16 UTM coordinates of Parker's house located 33.93/60 in. south of the 37_{00} grid line and 34.86/60 in. west of the 3_{25} grid line that you give to the F16 pilot are:

X: 325,000 − 354.18 = 324,645.82 E $1'' = 24{,}000'' = 609.6\,m$. (5)

Y: 3,700,000 − 345.03 = 3,699,654.97 m N (5)

$X = -\left(\frac{34.86}{60}\right)(609.6)$

$= -354.18\,m$



$Y = \left(\frac{33.96}{60}\right)(609.6)$

$= 345.03\,m$

7. What is GPS? Geographic Positioning System (2)

How does it work? Receives time and ID from a system of satellites; computer location on earth's surface using Cartesian coordinate geometry. (2)