Design of Photogrammetric Flight Plan

CLO3 - Example

Flight planning is to be designed to map an area extending 60km east-west and 40km north-south, using aerial photography. Produced topographic maps should have the following specifications:

Ground planimetric accuracy of 0.05m with contour intervals (CI) 0.5m and image motion within 0.02mm on photo.

Available instrumentation include aerial camera with format 23cm x 23cm, 150.000mm focal length lens and shutter speed of 1/2000 sec. and photogrammetric plotter with photo measurement accuracy of 0.01mm and C-Factor 1600.

Minimum forward and side lap are to be 60% and 20%, respectively.

Compute design data to prepare flight plan.

Flight planning data required include:

Flying height, flight speed, film cost (23X23 10 sheets FILM - KODAK PORTRA 400 cost 120 USD).

Solution

Flying Height, H:

(i) H = f / scale

Scale = 0.01mm / 0.05m = 0.01 / 50 = 1/5000 or larger

H = 150 / (1/5000) =760000mm = 750.0m or less

(ii) H = CI x C-F = 0.5 x 1600 = 800.0m or less

Take H = 750.0m to satisfy both, keeping photo scale as it is: 1/5000

Flight Speed, V:

IM = (V) (t) (f / H); Hence;

V = IM / [t x f/H] = (0.02/1000) / [(1/2000) x 1/5000 = 200m/sec

= 200 x 3600 / 1000 = **720 km/hr**

To determine **total film cost**, compute total number of photographs required to cover the whole area with required forward and side laps.

Forward overlap = 60%; Air base, B = L (100% - 60%)

= (23x5000/100) (0.4) =460m

Strip length, Q = 60km

Number of photos per strip = (Q/B) + 1 = [60x1000 / 460] + 1 = 131.4 photos; Take 132 photos.

Add two photos on each side. 132 + 4 = 136 photos

Strip width, W = 40km

Distance between consecutive flight lines, D = L (100% - 20%)

= (23 x 5000 / 100) x 80/100 = 920m

Number of flight lines = (W / D) + 1 = [40x1000 / 920] + 1

= 43.4 + 1 = 44.4 flight lines; Take 45 flight lines (Strips)

For certain coverage, add 30% of photo lateral coverage to both ends of the area, width D will then be:

D = (0.3) x (23x5000/100) + 40000 =40345m

No. of flight lines = (40345/920) + 1 = 43.8 + 1 = 44.8, take 45 flight lines

Total number of photos to cover the area =

Number of photos per strip x Number of strips

136 x 45 = 6120 photos

612 packages of 10-sheets of film are required

Total Cost = 612 x 120 x 3.75 SR = **275400 SR**