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Title: **EVALUATE THE GEOMETRIC DIMENSIONS ACCURACY OF AERIAL PHOTOGRAPHS**

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EVALUATE THE GEOMETRIC DIMENSIONS ACCURACY OF AERIAL PHOTOGRAPHS

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Abstract: In assessing the geometric dimensions accuracy of aerial photographs performs work included in the documents package requires the aerogeodetic and photogrammetric work implementation in the prescribed manner. This, in turn, is aimed at achieving an increase in the performed work accuracy and quality, that is, aerial photographs.

Keywords: aerial photography, geometric, aerogeodesic, scale, aerial camera.

Introduction

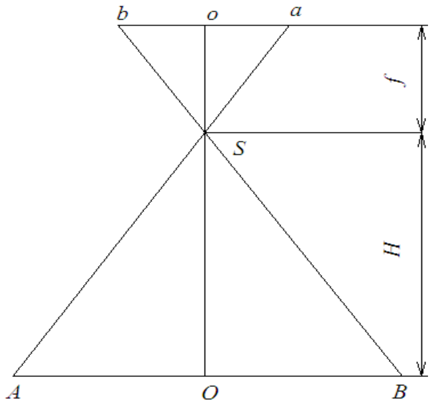
From the early years of independence of the Republic of Uzbekistan large-scale reforms are being carried out in all economy sectors to introduce new and modern technologies, scientific and technical achievements and best practices. As all other fields, geodesy, cartography and cadastre are developing in assessing the geometric dimensions accuracy of aerial photographs taken with digital aerial cameras, in forming a database about them, rapid and high-precision creation and updating of topographic maps and land cadastre plans with the help of aerial photographs. Therefore, evaluating the geometric dimensions accuracy of aerial photography is an important technological process.

The main part.

Evaluate the scale accuracy of aerial photographs

If the flat surface is photographed in the vertical position of the photographic film and the aerial camera optical axis relative to the ground, the aerial photograph is similar to the plan, i.e. the aerial photograph is a horizontal place projection.

The cross section ratio **l** in an aerial photograph to the line (L) at the corresponding location will be the aerial photographic scale. If the line AB on a flat surface is represented by ab in a plane parallel to it (Figure 1), then $\frac{ab}{AB}=\frac{l}{L}$ is the aerial scale. Since the triangles Sab and SAB are similar, $\frac{ab}{AB}=\frac{f}{H}$. If H:f=m,



1-form

It is called the numerical scale of the planned aerial photograph; here

m– scale denominator; f– the focal length of the apparatus, H– the flight altitude of the aircraft. The scale is the same everywhere in the planned aerial photography. When H and f are known, the aerial scale can be found.For example, if

f = 20 cm, H = 3120 m, $m=\frac{H}{f}=\frac{3120}{20}=$ 15600, i.e. the aerial photograph scale is 1: 15600.

$$\frac{f}{H}=\frac{1}{m}$$

The cross-sectional length d of the line in the aerial image, which corresponds to D, is as follows:D = md; scale is 1:15000, if 1=25 mm, D=1500. 25=375,00 m.

If the optical axis of the camera is not perpendicular to the aerial photograph plane, an oblique (inclined) aerial photograph is formed, in which the aerial photograph scale varies at

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different locations (Table 1). At such times, an average scale is often accepted.

The fact that the plane is flying at the same height from the ground does not change the aerial photograph scale. Accordingly, in order to maintain the same flight altitude, the aircraft is equipped with equipment such as a radiovisotomer, statoscope.

Detection and evaluation of the points location in the aerial photograph, although distorted under the influence of the angle of δ_α deviation.

The distance rc between the points marked on the aerial image and the point with the distortion at zero value is measured (Fig. 1). The measurement results are recorded in column 2 of the table.

The aerial image then measures the angle s between the principal vertical axis c and the marked points φ^0 from the point with zero distortion at the zero value, and the results are recorded in column 4 of table 1.

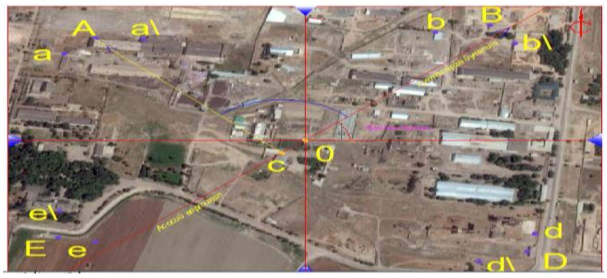

Fig1. The location of the points in the aerial photograph is distorted by the deflection angle

Determining and evaluating the points location distortion in an aerial photograph under the deflection angle influence

f – 100mm, H =1500 m, α = 1,5^0, sin α = 0,026
table-1

Point number	r_c	φ^0	cos φ^0	δ_α, mm
1	2	3	4	5
A	104	269	-0.02	0,1
A	91	278	0.14	- 0,3
a\	106	260	-0.17	0,5
B	115	357	1.00	- 3,4
B	98	350	0.94	- 2,3
b\	114	5	0.99	- 3,3
D	113	77	0.22	- 0,7
D	108	71	0.33	- 1,0
d\	104	86	0.07	-0 ,2
E	115	190	-0.98	3,4
T	105	184	-1.00	2,9
e\	106	199	-0.95	2,8

We calculate the points position in the aerial image using the formula for determining the distortion under the inclination angle influence:

$$\delta_\alpha = -\frac{r_c^2\ x\ sin\alpha\ x\ cos\varphi}{f}$$

r_c – the distortion is zero and the distance between the marked points;

φ^0 - the angle between the main vertical and the fixed points from the point where the distortion is equal to zero;

δ_α, - the points location in the aerial photograph is distorted by the deflection angle.

Corrections are made to the points deviation angle marked in the aerial photograph, the limiting error is taken as 0.2 mm.

Detection and evaluation of the point state in the aerial photograph under the relief influence.

By interpolating between the horizontals, we determine the total height of the marked points (Fig. 2) and lower them to column 2 of the table.

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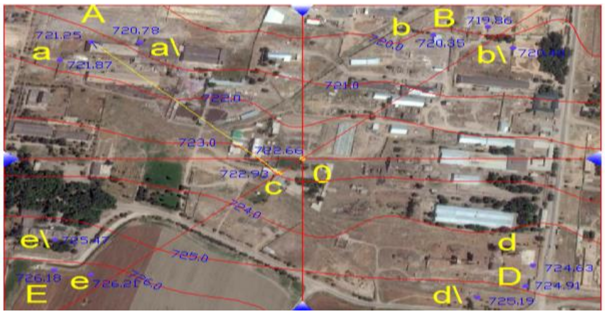
The relative equilibrium between the points is then determined and recorded in column 3. The distance **r** between the starting point **c** of the aerial photograph and the points marked on the image is measured, as shown in column 4 of table 2.

Table for detection and evaluation of point position distortion under the relief influence in aerial photography.

H = 1 500 м, $A_{ўр}$=710.00м table-2

Point number	A, m	h = A–A_{cp}, m	r, mm	δ_h, mm
1	2	3	4	5
A	721.25	11.25	105	+0.7
A	721.87	11.87	109	+0.8
a\	720.78	10.78	91	+0.7
B	719.86	9.86	104	+0.7
B	720.35	10.35	87	+0.6
b\	720.48	10.48	103	+0.7
D	724.91	14.91	113	+1.1
D	724.63	14.63	108	+1.1
d\	725.19	15.19	104	+1.1
E	726.18	16.18	115	+1.2
E	726.21	16.21	105	+1.1
e\	725.47	15.47	106	+1.1



r - distance from the aerial photograph center to the point.

Fig 2. In aerial photography, the distortion detection image of the point position under the relief influence.

We calculate the point distortion position in the aerial photograph under the relief influence by the following formula:

$$\delta_h = \frac{rh}{H} = \frac{rh}{mf}$$

A – the total height of the points;

H – shooting height;

h – relative height between points;

r – distance from the starting aerial photograph point to the set point.

We make corrections for relief to the inclination angle corrected from the aerial image center to the point.

Measurement and scaling in aerial photographs.

In the aerial photograph and in the plan, points are marked consisting of objects that have a good view (fig. 3), the distance between A a, V c, D d and E e and is measured and it is written in columns 2 and 3 of table 3.

Fig. 3. Measurement and scaling in aerial photographs.

Aerial photography scaling table

M= 1:10 000 table-3

Cutting	$L_{аэр}$, mm	L_{plan}, mm	m	average scale denominator
1	2	3	4	5
A a	6.27	3.1	1: 4 944	1: 4 947
B b	5.28	2.6	1: 4 924	
Dd	6.28	3.1	1: 4 936	
Ee	5.42	2.7	1: 4 982	

The aerial scale is calculated by the following formula and it is written in column 4 of table 3.

$$m = \frac{L_{пл}\,\mathrm{M}}{L_{cyp}}$$

$L_{пл}$- the distance between two points in the plan;

L_{cyp}- the distance between two points in an aerial photograph;

M –the plan scale is 1: 10,000.

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