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FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO  
NEW AERIAL CAMERA AFA-TES-10, (U)  
APR 77 V B ILIN  
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FOREIGN TECHNOLOGY DIVISION



NEW AERIAL CAMERA AFA-TES-10

by

V. B. Il'in



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NEW AERIAL CAMERA AFA-T<sup>E</sup>AS-10.

V. B. Il'in.

Pages 45-47.

In TsNIIGAIK are developed and created new topographic aerial camera AFA-T<sup>E</sup>AS-10 and the established/installed in it high-quality objective "Russar-63V" with focal distance  $f_k = 100$  mm. In the focal plane of objective is placed the glass with the calibrated grid of crosses whose image on aerial photographs makes it possible to introduce corrections for strain and nonequalization of unexposed aerial film. Objective has the low value of photogrammetric distortion, it possesses high frequency-contrast characteristic and resolution on entire image field, it provides the high accuracy of the stereoscopic guidance of the brand of instrument to the points of photographs.

Gate ZMM of this aerial camera - rotor type, which makes it



possible to lower dynamic loads, it has the low value of the minimum delay and the broad band of its change, thanks to which rises the quality of aerial photograph. Gate ZMM whose diagram is shown in figure, consists of three coaxially arranged/located lug/lobes; two of them 1 and 2 - workers, and the average 3 serves as cap/cover. Working lug/lobes are led to continuous and mutually counterrotation by electric motor 4. After their each of revolutions is open/disclosed the opening/aperture of gate; however, it overlaps the cap/cover, which does not have rigid kinematic kinematicsoy communication/connection with worker as lug/lobes. After pulse arrival from command instrument proceeds the function of solenoid 5 and the continuously rotating crank of 6 geneva wheel engages with Maltese cross 7, as a result of which they are turned cross and the kinematically connected with it cap/cover, which open/discloses the opening/aperture of gate. Delay  $\tau$  inversely proportional to the velocity of the rotation of working lug/lobes and, consequently, also engine.

$$\tau = \frac{k}{n_{\text{дв}}},$$

where  $k$  is the coefficient, dependent on the construction of gate;  $n_{\text{дв}}$  - the engine speed.

For providing a synchronism of the work of cap/cover and working lug/lobes are utilized contactors 8 and a series of relay.

Page 46.

The continuously rotating working lug/lobes and the short moment of resistance of the parts (cap/cover with its drive), included with pulse arrival from command instrument, provide short cycle time and the smooth unstressed work of gate. The automatic control of delay is achieved by sufficiently simple methods. For this it is necessary to regulate the engine speed directly proportional to the luminous energy, which enters from the object of photographing the photosensitive material.

Structurally gate ZMM is made in the form of the separate unit, which can be separated from aerial camera without the dismantling of its optical system. This makes it possible to carry out routine maintenance work on gate (but if necessary its repair or replacement) without a change in the mutual location of the optical components of aerial camera.

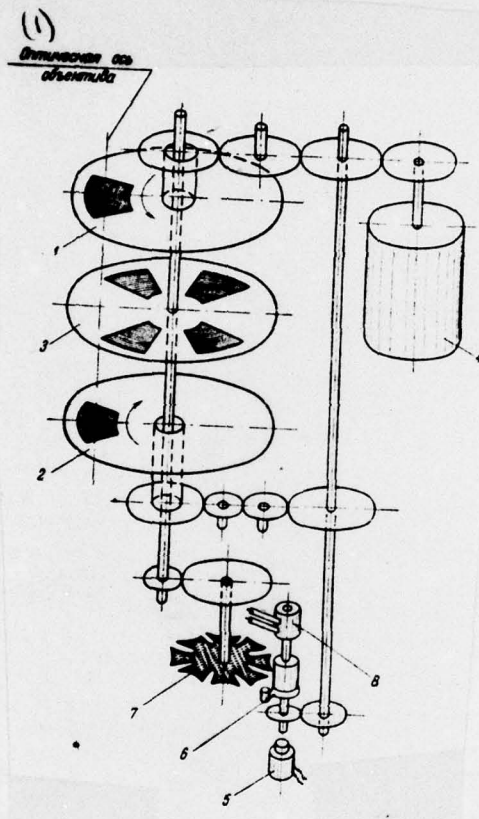
Gate ZMM for APA-TES-10 has a diameter of the overlapped opening/aperture 18 mm, which corresponds to the diameter of the acting objective aperture "Russar-63V" 100/6.8. During a decrease in the diameter of the overlapped opening/aperture the minimum delay can

be decreased to 1/1200-1/1500 s.

In aerial camera AFA-7ES-10 is applied the control circuits of exposure level on the integral luminous density of locality, which provides the sufficiently stable value of the average integral density of aerosurvey negatives. The automatic machine of control is photoelectric exposure meter, output signal from it it is supplied to the control system of the velocity of the rotation of the engine of gate, on which depends the holding time. Upon reaching of the minimum value of delay the control occurs because of a change in the relative opening/aperture of the objective of aerial camera. In this aerial camera is provided nonautomatic manual setting the value of delay.

The equalization of unexposed aerial film into AFA-7ES-10 is realized by its clamp to glass in the focal plane of objective. The high quality of the equalization of unexposed aerial film is provided by the stabilized tension of the unexposed aerial film before the exhibition and at its torque/moment, which is achieved by the application/use of an electromagnetic friction coupling with variable torque in conjunction with the retarded depression of pressing panel; the latter is omitted to glass not by an entire surface immediately, but in the manner that is closed the book. Furthermore, for high-quality equalization of unexposed aerial film the surface of glass and panel is made with insignificant deviations from plane.







Key: (1). Optical axis of objective.

Page 47.

In order to ensure the possibility of the sensitometric checking during the process of the photochemical treatment of aerial film, at any moment of aerial photography into AFA-*TES*-10 is provided printing in the midframe interval/gap of the image of sensitometric wedge on command/crew from control panel.

AFA-*TES*-10 is equipped by the control panel, which ensures monitoring of work of entire aerial camera. It can be exploited in the gyrostabilizing device GSU-M.

In assembly AFA-*TES*-10 they enter: aerial camera, two of cassettes, control panels with command mechanism, power supply unit, aerial survey equipment, cords, affiliation/accessories and packing boxes.

Basic technical specifications of the aerial camera: the focal length  $f_x = 100$  mm, relative aperture from 1:6.8 to 1:16, the range of delays from 1/70 to 1/850 s, the optical shutter efficiency not below 0.8, the grid of crosses with space 10 mm, aspect ratio 18 x 18 cm.,

the supply of film in cassette 60 m of (300 photographs), the cycle time of the work of aerial camera on long delays is 2.5 s, but on short -1.5 s.

On each sequence are printed the images of two annunciator/numerators, hours with the arrow/pointer per second, the numbers of aerial camera and value of the cell/elements of internal orientation, table for the notation of the code of object and date of photographing.

As a result of conducting the laboratory and flight tests of experimental models AFA-TES-10 established/installed following:

- a) the mean square error of the stereoscopic guidance of the brand of instrument to the points of aerial photographs is equal to  $\pm 3 \mu$ ;
- b) the resolution of aerial photograph is not below 25 line/mm (world of high contrast);
- c) photogrammetric distortion comprises not more than 20  $\mu$ ;
- d) the deviation of unexposed aerial film from the surface of pressing glass is not more than 15  $\mu$ ;

e) the contrast ratio is determined with accuracy  $\pm 50\%$ ;

f) the automatic machine of the regulating of exposure level provides the constancy of the average integral density of aerosurvey negatives with the error on the order of  $\pm 150\%$ .

The automatic regulating of exposure makes it possible subsequently to automate the process of the photochemical treatment of aerial film.

The introduction of the aerial camera AFA-7ES-10 into production will make it possible to obtain the aerial photographs of the increased quality, to introduce corrections for strain and nonequalization of unexposed aerial film and to effectively apply the analytical methods of photogrammetric treatment.



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55. SECURITY CLASSIFICATION OF THIS REPORT 56. SECURITY CLASSIFICATION OF ABSTRACT 57. DISTRIBUTION STATEMENT (If applicable)	58. SECURITY CLASSIFICATION OF THIS REPORT 59. SECURITY CLASSIFICATION OF ABSTRACT 60. DISTRIBUTION STATEMENT (If applicable)
61. SECURITY CLASSIFICATION OF THIS REPORT 62. SECURITY CLASSIFICATION OF ABSTRACT 63. DISTRIBUTION STATEMENT (If applicable)	64. SECURITY CLASSIFICATION OF THIS REPORT 65. SECURITY CLASSIFICATION OF ABSTRACT 66. DISTRIBUTION STATEMENT (If applicable)
67. SECURITY CLASSIFICATION OF THIS REPORT 68. SECURITY CLASSIFICATION OF ABSTRACT 69. DISTRIBUTION STATEMENT (If applicable)	70. SECURITY CLASSIFICATION OF THIS REPORT 71. SECURITY CLASSIFICATION OF ABSTRACT 72. DISTRIBUTION STATEMENT (If applicable)
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