Directions for Operating

Eastman Topographic Camera

Model K-1

EASTMAN KODAK COMPANY
ROCHESTER, N. Y., U. S. A.

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November, 1919

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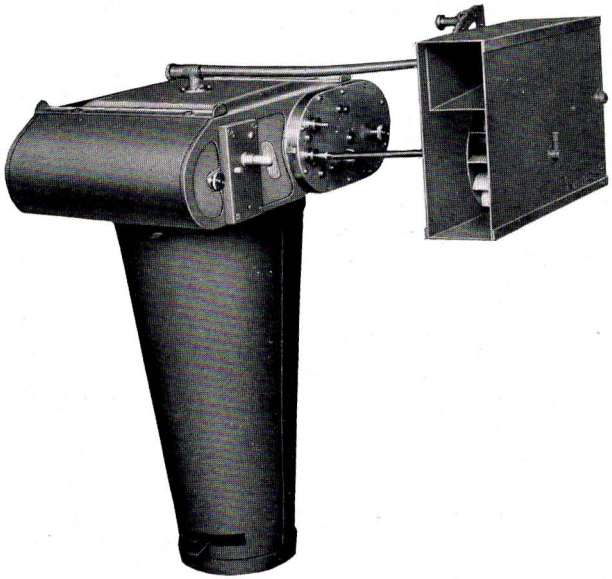


FIG. 1

Directions for Operating
Eastman Topographic Camera
Model K-1

The Eastman Topographic Camera, *Model K-1*, is designed to be mounted over an aperture in the floor of the observer's cockpit or in the bay immediately aft.

The camera is entirely automatic in its action. The driving power is provided by a wind motor mounted outboard with the control lever easily accessible to the pilot or observer. The exposures are made upon a continuous roll of Eastman Daylight Loading Orthochromatic Aero Film, $7\frac{1}{16}''$ x $9\frac{1}{2}''$ (18 x 24 cm.).

The film is held perfectly flat at the recording plane by constant vacuum suction, thereby overcoming all vibration of the film during exposure. Any number of exposures within the limitation of a roll of film may be made at will by a simple manipulation of the lever controlling the wind motor.

The camera is supplied fitted with a 12″ or 20″ lens. The lens is carefully adjusted and rigidly set at infinity focus, and provision is made for readjustment of the focus should it be necessary. The speed of the Focal Plane Shutter and the interval between exposures are both easily adjusted to meet the variation in altitude of the airship, speed of flight, and vibration.

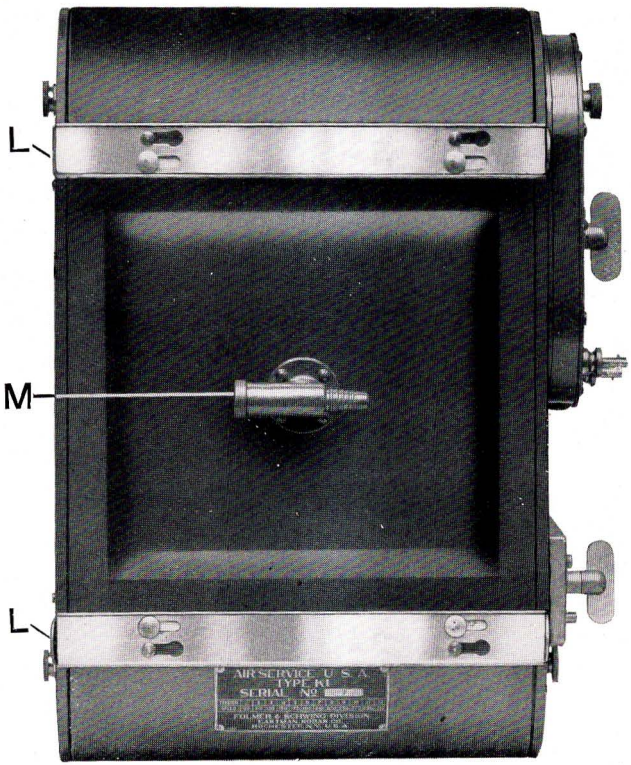


FIG. 2

Eastman Topographic Camera in Detail

Cycle of Operation The automatic cycle of operation is as follows: After each exposure, a safety curtain is instantly interposed between the lens and film. The film is then wound into position for the next exposure; the Focal Plane Shutter is reset, and the safety curtain is withdrawn just before the next exposure is made.

Removing the Vacuum Back Push the two sliding locking bars LL, Figure 2, to the left and lift off the Vacuum Back.

The Vacuum Back The inner side of the vacuum back consists of a perforated platen. As the film is automatically drawn across the recording plane it is held in close contact with this platen by means of constant suction provided by the venturi tube which is connected with the suction head M, by means of a rubber hose. See Figures 1 and 2. In order to guard against excessive suction on the film, the suction head is provided with a valve at one end. This valve automatically opens as the suction increases beyond the point required to hold the film flat and free from vibration. The platen, across which the film is drawn, is especially constructed to overcome static effects in the film caused by undue friction between the film and vacuum back. Static electricity, generated as the film is drawn from the roll, is collected by the brush X partially encircling and in contact with the roll of film. See Figure 4.

The Shutter A Graflex Focal Plane Shutter having a one-piece curtain with a metal bound

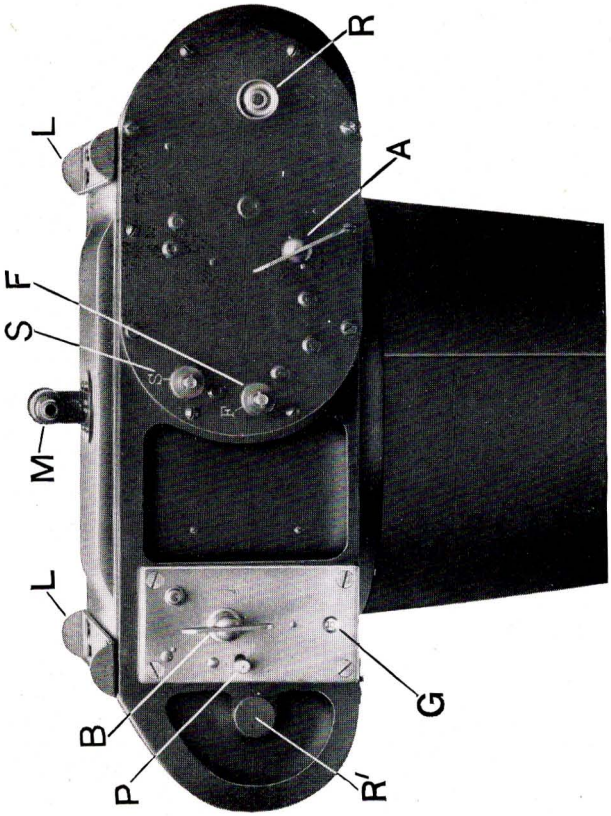


FIG. 3

fixed aperture $\frac{3}{4}''$ wide, is built into the body of the camera. The shutter curtain operates as closely as possible to the recording plane and permits the lens to work at its highest efficiency throughout the period of exposure. The speed of the exposure, or the rapidity with which the aperture in the curtain passes across the recording plane, is regulated by adjusting the tension on the curtain.

Hand Operation of Camera Six and one-sixth complete revolutions of the key A, immediately after the shutter has been released, makes one complete cycle of operation. This provision for hand operation is to permit inspection of the camera on the ground when disconnected from the power drive or for making a single exposure in the air.

The Shutter Speed Plate The metal plate attached to the end of the camera, Figure 2, gives the approximate shutter speeds in fractional parts of seconds, obtained by using the various tension numbers, 1 to 12.

TENSION	1	2	3	4	5	6	7	8	9	10	11	12
SPEED	90	110	130	150	170	190	210	230	250	270	290	310

Regulating the Shutter Speed Tension on the curtain is increased by turning the key B, Figure 3, to the right until the tension number indicating the required shutter speed is registered at the aperture G. The shutter speed is decreased by pressing forward on the escapement P until the lower tension number required is registered at G. Example: $\frac{1}{230}$ of a second, set tension at 8.

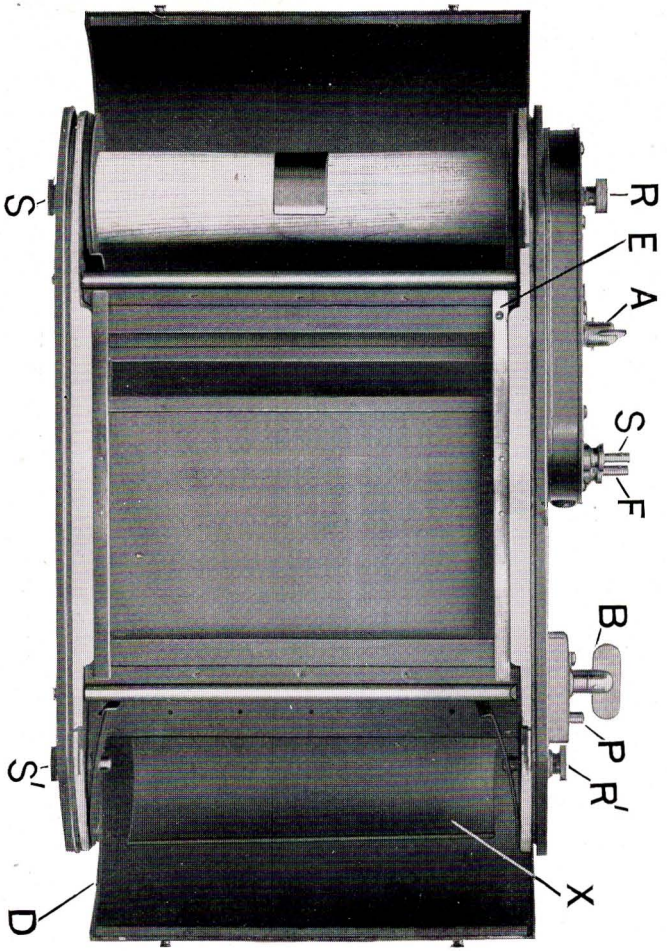


FIG. 4

Spool Centers All four of the spool centers, R, R-1 and S, S-1, Figure 4, are provided with an internal spring which keeps them firmly engaged with the recess in the ends of the film spools when loaded in the film compartments.

The two spool centers R and R-1 have a web which engages with the slot in the metal end of the film spool. The spool center R is rotated by the mechanism operating the shutter and automatically winds the exposed film upon the empty spool shown in the film compartment. The spool centers S, S-1 when drawn outward and turned to the right or left are held in extended position by a pin which is thrown out of engagement with one of the holes in the milled head.

Movement of the Film The movement of the film across the recording plane is entirely automatic and continuous as the Focal Plane Shutter and safety curtain are alternately released and reset between exposures.

Loading the Camera Draw out the spool center S-1 and set in extended position. Hold out the spool center R-1 and before breaking the paper seal on the spool of film, press the flanges of the spool against the tension springs at the ends of the film compartment, and push the roll in as far as it will go. Release the spool centers R-1 and S-1, and turn the roll of film, until the spool centers snap into position in the ends of the film spool. The roll of film must be placed in the film compartment so that the film will unwind from the top of the spool and the paper seal should not be broken until the spool is in position. See that the brush X,

Figure 4, encircles the Film Roll when closing door D.

The Winding Spool Pull out the spool center S and lock in extended position. Hold out the center R and press the empty winding spool against the two springs and into the film compartment as far as it will go. Release the two centers R and S and rotate spool until the centers snap into engagement with ends of the spool.

Attaching the Film Break the paper seal on the roll of film and draw paper across the recording plane, slipping the end under the brass spring clip on the winding spool. If the brass clip is not in position, turn winding key A a few revolutions in order to bring the clip into the most convenient position for attaching the paper. Then turn the key A until the winding spool makes a little more than one revolution—enough to securely bind the paper upon the spool.

Tension on the Film Spool The film compartments are both provided with a spring at each end, which causes considerable tension on the metal flanges of the film spool, as well as the winding spool.

Marking the Film The marker E, Figure 4, located in one corner of the recording plane is automatically operated with each exposure, causing a little indentation to be made in the film between every exposure, indicating where the film should be cut in order to avoid mutilating exposures.

Attaching the Vacuum Back Swing up the doors of the film compartments and place the vacuum back in position, shown in Figure 2, with the

locking bars LL to the left, then while pressing inward on the two compartment doors, engage the holes in the locking bars with the studs on the doors and press the locking bars to the right as far as they will go, securely locking the doors and vacuum back in position.

Setting the Film for Exposure After the vacuum back has been attached, set the exposure tally at zero, then run the motor or turn key A until the tally shows 12. This will wind off the duplex paper bringing the film in position for exposure. Do not open the camera back after the paper has been wound off, as the film is wholly unprotected and the entire roll will be light-struck if the back is removed, except in a dark room with the aid of a photographic safelight. The spool center R-1 will revolve until film and paper are completely unwound from spool, and then stop. After the roll of film has been exposed, the duplex paper on the inner end of roll is wound over the exposed film on the spool, and the exposed film may then be unloaded in daylight.

The Safety Curtain The safety curtain is located at the bottom aperture of the camera, just above the base of the lens cone. See Figure 5. This curtain is automatically opened after the Focal Plane Shutter has been set by turning the winding key A to the right, or when the cable from wind motor is attached to and operates the terminal F or S. As the key A or the terminal F or S continues to revolve after the shutter has been released to make an exposure, the safety curtain is automatically tripped, closing the aperture, and the shutter is then reset without danger of prematurely exposing the film as it is automatically wound into position

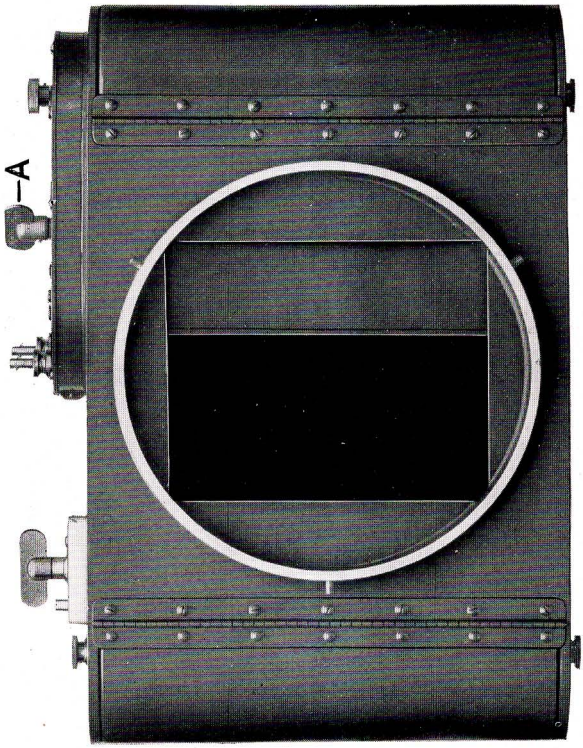


FIG. 5

for the next exposure. At the point where the shutter in turn closes the recording plane, the safety curtain is quickly drawn back out of the way before the shutter curtain is again released.

The K-1 Wind Motor The wind motor should be mounted on the outboard side of the fuselage. The control lever N, see Figures 6 and 7, is located inboard in a position convenient for the pilot or observer. The motor consists of a rotary paddle wheel which is operated by the wind pressure generated by the flight of the airship. The flexible driving cable of the motor is connected with either the fast Terminal F or the slow Terminal S on the camera, see Figures 1 and 3, dependent upon the interval between exposures required by the conditions of flight.

The Interval of Exposure

The regulation of the camera directly affecting the photographic result is that which controls the interval between exposures when flying at varying altitudes and speeds.

Altitude At definite altitudes the 12″ and 20″ lenses cover clean and sharp, definite areas of territory. See tables 1 and 2, pages 20, 21. Variation in altitude of flight is an important factor in the computation of the interval between exposures that will produce the required amount of overlap in all the prints made from a series of negatives, thereby permitting accurate matching together of every picture of the photographic map.

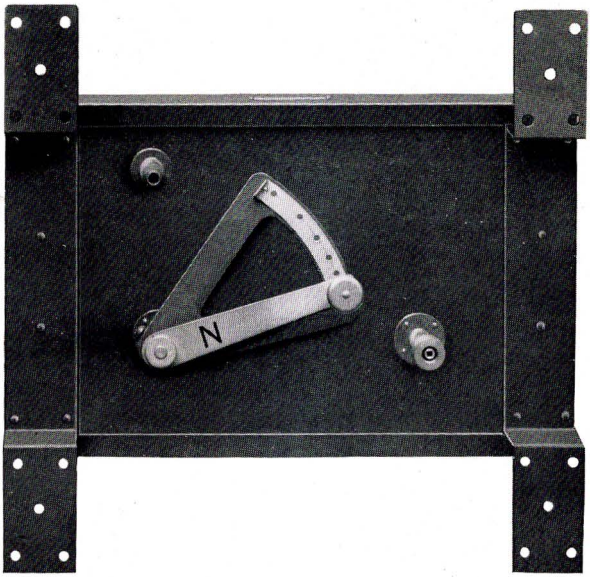


FIG. 6

Speed of Airship Tables Nos. 1 and 2 on pages 20 and 21 give the approximate interval between exposures in seconds, that will produce 25% and 50% overlap in the pictures made with a 12″ or 20″ lens at varying altitudes and ground speeds of airship.

Speed of Shutter The shutter must be operated with a rapidity that will compensate for the speed and vibration of the airship in order to produce sharp detail in the negatives. It is suggested, however, that the shutter be operated at the lowest possible speed consistent with the prevailing light conditions, thereby insuring fully timed negatives and maximum definition.

It will be seen that the interval between exposures and overlap in the pictures made with the Topographic Camera, Model K-1, is controlled by four variable factors—altitude of flight, ground speed of airship, speed of wind motor and speed of driving Terminal on camera.

Regulating Speed of Wind Motor The lever N, Figures 6 and 7, swings on a sector having 6 points of regulation—1 to 6. When the lever rests on O the damper located in front of paddle wheel is closed, preventing the passage of air through the motor tunnel. When the lever is set at 6, the damper will be fully raised, permitting motor to run at its greatest velocity and power. The speed of motor at all points of regulation is given in the table 3 on page 22.

The Terminal S The slow Terminal S has a speed of 600 revolutions for every cycle of operation of camera. With the motor control lever N, see Figures 6 and 7, set at 4 and the flexible driving cable

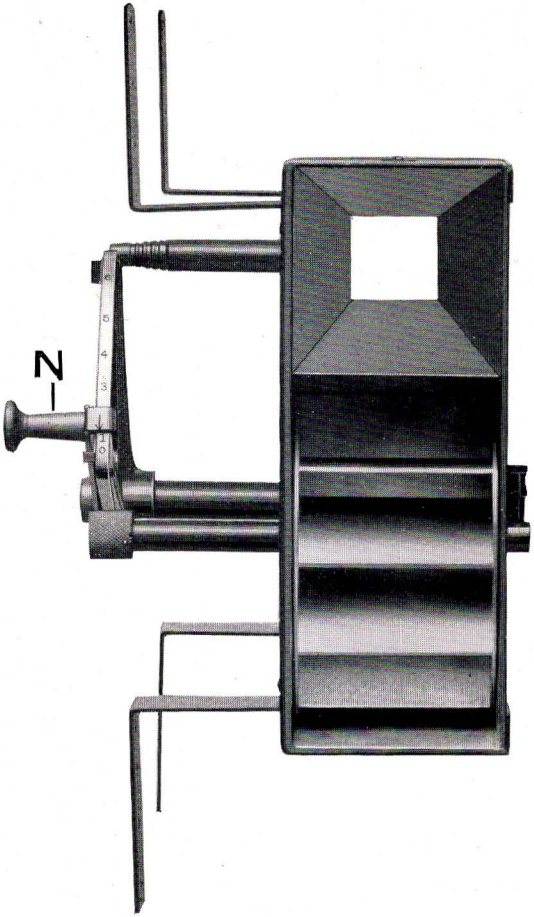


FIG. 7

attached to Terminal S, the interval between exposures will be approximately 11 seconds at an airship speed of 90 miles per hour.

The Terminal F The fast Terminal F has a speed of 300 revolutions for every cycle of operation of camera. If the flexible cable is attached to Terminal F, which operates camera almost twice as fast as the Terminal S, and the Wind Motor Control N is set at 4, the interval between exposures will be approximately 7 seconds at 90 miles per hour.

Regulating Overlap In Pictures with 20″ Lens Having decided upon the altitude from which the pictures will be made and the percentage of overlap required in the prints, the approximate interval between exposures will be found in the column of table 1 designating the ground speed of airship. For example:—If the altitude is to be 5000 feet and the ground speed of airship is about 90 miles per hour, the interval between exposures with a 20″ lens will be 10 seconds for a 25% overlap in the pictures, and 6 seconds for a 50% overlap. Table 3 shows that point 5 of the wind motor regulator will give 10 seconds between exposures at 90 miles per hour, with the driving cable attached to the Terminal S on the camera. If the driving cable is attached to the F terminal on the camera, the interval between exposures will be 6 seconds, covering the requirements for the 50% overlap under the same conditions.

Regulating Overlap In Pictures with 12″ Lens If the Eastman Topographic Camera, Model K-1, is equipped with a 12″ lens, table No. 2, page 21

should be used to determine the interval between exposures required for various altitudes, ground speed of airship and overlap.

If the pictures are made at an altitude of 3000 feet, at 90 miles per hour, the interval between exposures with a 12″ lens will be 10 seconds for a 25% overlap and 6 seconds for a 50% overlap, Reference to table 3, page 22 shows that the motor regulator N must be set at 5 for 25% overlap. If, for any reason, the ground speed of the airship is reduced to 80 miles per hour at the same altitude—3000 feet, the motor regulator N should be advanced to 6, thereby maintaining the 10 seconds interval between exposures required for the 25% overlap.

Furthermore, allowance must be made for any difference between the ground speed and air speed of the plane due to prevailing winds and direction of flight. For example:—Supposing the airship has an air speed of 60 miles per hour and flies against a wind of 30 miles per hour, it is obvious the plane will pass over the ground at a speed of only 30 miles per hour, which will determine the required interval between exposures.

Care of the Lens

Before loading the camera, carefully examine the front surface of the lens. Although the lens is mounted within the cone, oil and other matter from the engine frequently accumulates upon its surface, impairing the qualities of illumination and definition. The soil should be carefully removed with soft linen fabric or optician's paper.

Lubrication

At frequent intervals, the band encircling the operat-

ing mechanism, should be removed and a few drops of high grade light sewing machine oil carefully applied to all the bearings. *Remove all surplus oil* from the parts after lubrication, as a precaution against injurously staining the film. The binding screw holding the band in position is located adjacent the terminals F and S. The oil cup and the oil well on the bearings of the wind motor should frequently receive a few drops of light, high grade oil.

EASTMAN KODAK COMPANY
ROCHESTER, N. Y., U. S. A.

Eastman Orthochromatic Aero Film

For the

Eastman Topographic Camera

Model K-1

No. 75, 9½ ins. x 25 feet, 37 Exposures - -	$11.36
No. 75, 9½ ins. x 50 feet, 70 Exposures - -	21.19
No. 75, 9½ ins. x 75 feet, 100 Exposures - -	31.00

The prices of Film include Excise War Tax.

TABLE No. 1

For 20″ Lens.

Seconds between exposures required for 25% and 50% overlap—18 cm. length—in pictures made with

Eastman Topographic Camera, *Model K-1*

Ground Speed of Air Ship	Miles per Hour												Terrain	
	60		70		80		90		100		110			
Overlaps	25%	50%	25	50	25	50	25	50	25	50	25	50	18 cm.	22 cm.
Altitude in Feet													Feet	
1000	3	2	2	1	2	1	2	1	1	1	1	1	354	433
2000	6	4	5	3	4	3	4	2	3	2	3	2	709	866
3000	9	6	7	5	6	4	6	4	5	3	4	3	1063	1299
4000	12	8	10	6	9	6	8	5	7	4	6	4	1417	1732
5000	15	10	12	8	11	7	10	6	9	6	8	5	1772	2166
6000	18	12	15	10	13	9	12	8	10	7	9	6	2126	2599
7000	21	14	18	12	15	10	14	9	12	8	11	7	2480	3032
8000	24	16	20	13	18	12	16	10	14	9	13	8	2835	3465
9000	27	18	23	15	20	13	18	12	16	10	14	9	3189	3898
10000	30	20	25	17	22	15	20	13	18	12	16	11	3544	4331

Allow 25% greater air speed if Wind Motor is in Propeller Blast.

TABLE No. 2

For 12″ Lens.

Seconds between exposures required for 25% and 50% overlap—18 cm. length—in pictures made with

Eastman Topographic Camera, *Model K-1*

Ground Speed of Airship		Miles per Hour												Terrain	
		60		70		80		90		100		110			
Overlaps		25%	50%	25	50	25	50	25	50	25	50	25	50	18cm.	22cm.
Altitude in Feet														Feet	
	1000	5	3	4	2	3	2	3	2	3	2	2	1	591	722
	2000	10	6	8	5	7	5	6	4	6	4	5	3	1181	1444
	3000	15	10	12	8	11	7	10	6	9	6	8	5	1772	2165
	4000	20	13	17	11	15	10	13	8	12	8	11	7	2362	2887
	5000	25	16	21	14	18	12	16	11	15	10	13	9	2953	3609
	6000	30	20	25	17	22	15	20	13	18	12	16	11	3544	4331
	7000	35	23	30	20	26	17	23	15	21	14	19	12	4134	5053
	8000	40	26	34	23	30	20	26	17	24	16	22	14	4725	5774
	9000	45	30	38	25	34	22	30	20	27	18	24	16	5315	6496
	10000	50	33	43	28	37	25	33	22	30	20	27	18	5906	7218

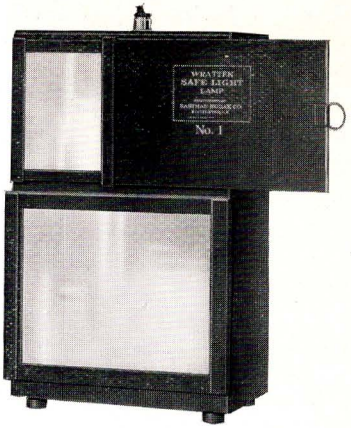
Allow 25% greater air speed if Wind Motor is in Propeller Blast.

TABLE No. 3—Wind Motor Regulation

Seconds between exposures obtained by regulating speed of Wind Motor operating the Eastman Topographic Camera, *Model K-1*

Motor Regulation	Air Speeds—Miles Per Hour					
		60	70	80	90	110
		S Terminal on Camera				
	1	..	..	35	25	13
	2	..	..	22	15	11
	3	27	20	16	12	10
	4	22	17	14	11	9
	5	18	14	12	10	8
	6	17	12	10	9	7
		F Terminal on Camera				
	1	..	..	..	..	..
	2	22	16	12	10	7
	3	15	12	9	8	7
	4	14	10	8	7	6
	5	11	8	6	6	6
	6	11	7	5	5	5

Work in a better light—Work in a safer light.



Wratten Safelight Lamp

The soft, indirect light from the Wratten Safelight Lamp is restful to your eyes—it's a better light to work in, and the Safelight makes it safe. There is plenty of light and a definite standard of safety.

Safelights are made for plates of varying degrees of sensitiveness and may be quickly interchanged. The No. 2 Safelight is furnished unless otherwise specified.

All Dealers.'

EASTMAN KODAK COMPANY

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