Action of gases

On the cartridge being primed the cordite is turned into gas which forces the bullet up the barrel. Four inches from the muzzel part of the gases enter through the gas port into the gas chamber and passing through the large hole in the gas regulator enter the gas cylinder. Here they strike against the cupped head of the piston rod and drive it to the rear.

Action of Piston Rod and Return Spring

During the first 1⅛" of the backward travel of the piston rod the striker post travels along a straight pathway in the camway groove and the teeth of the rack engaged with the teeth of the pinion the winding up of the return spring commences. This 1⅛" travel is a saftey device to ensure that the gas pressure on the face of the bolt has dispersed before the bolt is unlocked

Action of Bolt and Extractors

The right side of the striker post now bears against the curved portion of the camway groove causing the bolt to rotate ⅛ of a turn to the left. This action unlocks the bolt and places the resistance lugs in line with the cruciform grooves. The striker post now bears against the rear of the camway groove

and piston and bolt come back together. As the bolt comes back the extractors bring back with them the empty case

Action of the Ejector

The left guide lug of the actuating stud now strikes the tail of the ejector which working on a pivot causes the head to travel across the face of the bolt. It strikes against the base of the empty cartridge and knocks it out of the ejection opening on the right of the body.

Action of the Feed Arm & Pawls

As the bolt comes back the boss on the actuating stud working in the curved channel at the tail of the feed arm forces the feed arm to move from right to left. The feed pawl being engaged behind a corrugation of the magazine rotates the magazine clockwise one corrugation. The feed-pawl spring stud bearing away from the right stop pawl allows it to come forward in front of the corrugation thus preventing the magazine from rotating too far. The left stop pawl is depressed by a corrugation and rises behind it.

Action of the magazine.

As the magazine rotates the cartridge which is held in the magazine by the outer circum. and separating pegs is forced down into the feedway by means of a cartridge guide spring assisted by the slope of the

centre block. It is now in position in the slot in the top of the body ready to be pushed forward by the top extractor in the forward movement.

Action of the Sear

Piston rod and bolt continue their backward movement and if the trigger is released the nose of the sear will engage with the butt on the piston rod as the latter commences to go forward.

Forward Movement.

1, Release of the Sear

2, Forcing of the cartridge into the chamber.

3, Action of the Bolt.

4, Action of Ejector

5, Priming of the cartridge

NOTE During the forward movement the magazine does not rotate.

6, Action of Feed Arm and Pawls

Release of Sear.

When the trigger is pressed the nose of the sear will become disengaged from the bent of the piston rod. The return spring will carry the piston rod forward and the striker post bearing on the left side of the camway groove and resistance lugs being in the cruciform guideways the bolt is unable to rotate and is carried forward.

Forcing of the Cartridge into the Chamber.

As the piston rod and bolt move forward the top extractor strikes the lower edge of the rim of the cartridge forcing

it into the chamber where the extractors spring open and grip the rim.

Action of the Bolt.

The resistance lugs are now opposite the locking recesses and the bolt is now free to rotate The left side of the striker post bears against the curved camway This caused the bolt to rotate ⅛ of a turn to the right and lugs enter the locking recesses When the gun is fired the resistance lugs being engaged in the locking recesses take the shock of the discharge

Action of the Ejector

As the bolt moves forward it strikes the head of the ejector and forces the tail into the bolt-way.

Priming of the Cartridge

The striker post now travels along the straight portion of the camway groove. The striker passes through a hole in the face of the bolt and so primes the cartridge.

Action of Feed Arm and Pawls

During the forward movement the boss on the actuating stud working in the curved channel in the tail of the feed arm moves the feed arm from ⅄ left to right. The feed pole rides over the corrugation of the magazine and engages behind it ready for the backward movement The feed pole spring stud bears against the right slip pawl and forces it out of action. The left slip-pawl remains stationary

and prevents the magazine from rotation anti-clockwise.

Care and Cleaning

1/ Oil to be used (a) Oil for low temperatures for lewis guns.
(b) Dont use ordinary g.s. as it gets sticky in cold air.
(c) Use P.9.24 In very hot weather a mixture of P924 and g.s oil may be used
2/ Oil sparingly as too much oil causes stickyness in cold weather
3/ Method of Oiling. Use a camel hair brush, failing this use a pad of 4"×2" flannelette. Cotton waste should not be used.
4/ Parts to be oiled 1/ Sides of piston heads and rings. 2/ Striker post and cam-groove. 3/ locking recesses 4/ Around magazine post under feed arm. 5/ All worms and threads. 6/ All pawls springs and studs 7/ Pinion, edges of return spring and rack 8/ Surface of bolt (not face.) 9/ Feed arm channel 10/ Pivot of ejector 11/ Ribs on body-cover.

To clean

1/ Barrel (a) with bolt and piston in position. Pull back cocking handle till the sear engages. Insert a piece of 4×2 in the eye of the cleaning rod and cover it with oil. Push the rod into the barrel from the muzzel and pass it up the barrel until it is clean Finally pass an oily piece of 4"×2" up the barrel and leave it oily. If time allows take out the piston rod and bolt and if the barrel is still dirty insert the cleaning rod from each end and repeat the process

c) If rust or metallic fouling is present use the double pull-through. Oil the gauze and drop the weight down the barrel from the breech end. Have the gun held and pull the cord backwards and forewards until the barrel is cleaned. Before firing remove the oil by pulling through a clean piece of 4"x2".

(e) If the gun has fired more than 600 rounds pour boiling water down the barrel the recoil.

Gas Cylinder

Screw a wire brush on the cleaning rod oil it and work it backwards and forwards in the cylinder. Clean cylinder with a mop.

Parts to Examine for Carbon Deposit.

Gas Chamber, regulator and piston head. Clean off carbon deposit by scraping with a knife

Testing Ammunition

Examine each round for :-

(a) Misshape ~~of~~ or split cases by inserting a spare new barrel and by eye.

(b) Thick rims by pushing through a Nickers extractor or similar gauge

(c) Sunken caps by eye.

(d) length, by passing through gauge

(e) Loose bullets by feeling for looseness

Testing the magazine.

1) See magazine rotates freely

2) Place magazine on magazine post and turn it to see that the corrugations are not bent. if suspicious see whether the feed pawl engages

3/ Examine separating pegs for looseness or damage
4/ Examine the lip of the aluminium centre for burs.
5/ See the latch is working
Parts to be examined after Firing
1/ Striker post and camway groove for wear 2/ left guide lug and resistance lugs. 3/ cartridge guide spring 4/ Extractors 5/ Gas cylinder may be split at each end.
Points before taking a gun up.
1/ See the gas regulator has the large hole to the rear and gas regulator key is properly fixed.
2/ Mounting yoke.
2a Deflector bag if used.
3/ Cocking handle correctly fixed
4/ Return spring weighed and correct tension.
5/ Cartridge guide spring acting as a spring
6/ See sights are correctly fixed
7/ Fire a short burst into the ground
8/ Scarf mounting swing and test.
Tools and spares to be taken up.
1/ Bolt complete 2/ Pinion group with spring at the correct weight.
3/ Piston rod 4/ Cartridge guide spring 5/ Feed pawl 6/ Extractors
7/ Ejector 8/ Cocking handle 9/ Stop pawl spring
Tools
1/ Screw driver 2/ Spring balance
3/ Toggle for pulling back cocking handle. 4/ Dummy round 5/ loading handle 6/ Bag for empties (where deflector bag is used)
Points during Flight:
During flight the working portions must be worked backwards and forwards 15 to 20 times every 10 mins

in order to free the portions in case they may be getting clogged.
1/ Replace a nearly empty magazine at the first opportunity.
Points after Firing.
1/ See gun is unloaded. 2/ Oil bore, gas chamber, gas cylinder, and regulator 3/ Ease the return spring 4/ Thoroughly clean gun as soon as possible.

The Camera Gun

Its object is to correct the gunners aim when flying. The photo of the actual aim is made (i.e.) of of the aeroplane at the time the trigger of the gun would be pressed and by means of a glass screen which markings (5 concentric circles) are registered on the film, the correctness of the aim can be judged.

Mark III Gun camera.
On pulling back the cocking handle
1/ A fresh part of the film is wound into position
2/ The return spring is wound up.
3/ The indicator is altered.
On pressing the trigger, the exposure is made
Sights
The ring-sight and fixed bead foresight are so harmonised that the object covered by the bead in the centre of the inner ring of the back sight should appear in the centre of the glass screen as well, while the outermost circle on the screen is of such a size as to project the same amount at any given range as the ring-sight so that the glass screen is the ring-sight

in duplicate.
The Photo Teaches
1/ Errors in deflection 2/ Errors in elevation
1/ Shown by position of the pilots seat with respect to the outside circle which is equal to the ring-sight (R.S rule 5.)
2/ Judged by the direction the machine is going in as regards the centre of the circles which is the centre of the ring-sight.
3/ Range at which exposure was made calculated from
a/ Span or length of machine fired at: Armstrong-Whitworth span 40ft length 20ft. Sopwith two-seater span 35ft length 25ft
b/ Value of the space between two circles at 200yds which is 8ft
80ft ÷ 10 spaces = 8ft per space

c/ The number of spaces covered by the machine on the photo
At what range is an Armstrong-Whitworth when its span covers 4 spaces. 40÷8 = 5 spaces are covered at 200yds 4 spaces are covered at
200×5÷4 = 250yds

No 1 The Ring Sight

1 Evolution of Sights a battle sight.
b da Preer. c CG sight d improved CG
e Ring sight

No 2 Deflection

a Speed of bullet
b Speed of enemy machine
c Deflection automatically allowed for by sight
d Projection of ring sight gives correct deflection.

DIA. I

Nº3 Rules

a Bead of foresight must be kept centrally situated in the inner ring of the back sight.

Nº4

b The eye must always be kept at the correct distance from the centre of the ring-sight (12") over the spade grip about 19"

DIA III

No 5 c The axis of the enemy machine if produced must cut the centre of the inner ring.

DIA IIII

No 6 Speed of Enemy Machine

a Average 100 m.p.h

b Diving

c Climbing

Difficulty of estimating speed

Nº 7 The ring sight accounts for any range up to 400 yds.

DIA V

Nº 8 The ring sight as a range finder

DIA VII

Nº 11

Action of Norman Compensating Foresight.
a Effect of the speed of machine on the sight.
b Deflection of the gun. Bullet follows the line of sight.

DIA IX

Nº 9

The Norman Compensating Foresight.
Evolution
a Blade and barley-corn
b C.G.
c Improved C.G.
d Norman Compensating Foresight.

№10 Need for moveable foresight
Force of bullet, force of explosion
speed of the gun machine

№12 Variation of Own Speed.
a Sight accurate in any position
b Illustration
Firing at a machine stationary
" " " " end on
" " " " flying at the
same speed and in the same
direction
" " " " flying in an
opposite direction.

No 13 Tracer and its Uses

a Unreliability at long ranges

b Reasons thereof

The Hazelton Mazzel Attachment

Air-Force
Law

Cadet W Warren 179269
No 5 Squadron
No 7 Observer's School
of Aeronautics
Bath

Air Force Law

The Powers of an Officer Commanding a Squadron

A Squadron Commander may award an airman punishment not exceeding seven days C.B. for minor offences.
He may award extra guards and piquets for offences on those duties, and fines for drunkeness
He may deal with cases of absence without leave and may award any punishment within

his ordinary powers for such absence

In all cases where an airman forfeits pay he must be offered the option of a D.C.M. before any award is made by the Squadron Commander

In the case of an officer of less than three years service the above power may be limited by the Commanding Officer to an award of three days CB.

Any such awards will be subject to any remission the Commanding Officer may order, but cannot be increased.

Fines for Drunkeness

First Offence — No fine

Second Offence — 2/6

Third and every subsequent offence 5/-, but if the third or subsequent event occurs within six months of the preceding offence - 7/6 and if within three months - 10/-

The time during which an airman is absent from duty by reason of imprisonment, detention or absence without leave is not to be reckoned in the above periods.

An airman should not be fined for drunkeness when unpaid fines amount to 20/-

An airman who is drunk is to be placed under close arrest and alone if possible in a guard detention room.

He may be deprived of his boots except when the weather is cold and he is likely to suffer inconsequence.

He is to be visited and his condition ascertained at least

every two hours by an N.C.O of the guard and an escort

Should any symptoms of a serious illness be observed a medical officer is forthwith to be sent for.

An airman suspected of being drunk is not to be put through any drill or tested for the purpose of ascertaining his condition.

An airman charged with drunkeness is not to be brought before an officer for an investigation of the charge until he is perfectly sober.

For this purpose twenty-four hours should usually be allowed to elapse before investigation

The Officer Commanding a Squadron (may) admonish or repremand an N.C.O, up to, and including the rank of corporal.

The Powers of a Commanding Officer

The Commanding Officer of a unit can award :-

(a) Summary Punishments
(b) Minor "

Summary Punishments

1/ Detention up to 28 days
2/ Fines for drunkeness up to 10/-
3/ Deductions from ordinary pay to recover loss or damage
4/ Field punishment up to 28 days
5/ Forfeiture of ordinary pay up to 28 days.

(b) 4 and 5 on active service only

Minor Punishments

He may admonish an airman or N.C.O
He may severly repremand an N.C.O
He may award extra guards and piquets for offences on those duties

He may award 14 days C.B.
He may order an acting or temporary N.C.O. to revert to his permanent rank
In cases of absence without leave he can award detention up to 168 hours, for any absence up to 7 days after that he can only give day for day

Esprit de Corps – Pride of Corps

Discipline

Discipline is instantaneous, unquestioning uncompromising, implicite and cheerful obedience
Therefore it may be said to be the art of making people do things as if they really liked doing them

Arrest

Air Force custody means:-
a. Arrest
b. Confinement, and includes naval and military custody

Arrest
a. Close
b. Open

Close Arrest (In the case of an officer) Confined to quarters. Exercise only under supervision.

Open Arrest (In the case of an officer) He may quit his quarters for exercise within confined limits and not under supervision
When under arrest he may not enter a mess or place of amusement, appear outside quarters except in uniform or wear sash sword, belt, or spurs.
Military custody in the case

Redress of Wrongs

If an officer thinks himself wronged by his C.O. and on due application made to him does not receive the redress to which he may consider himself entitled he may complain to the Air Council in order to obtain justice, who are hereby required to examin into such complaints and through a Secretary of State make their report to His Majesty in order to receive the directions of His majesty thereof

Mode of Complaint by an Airman

If an airman thinks himself wronged in any matter by an officer other than his captain or by any airman he may complain thereof to his captain and if he thinks himself wronged by his captain either in respect of his complaint not being redressed or in respect of any other matter he may complain thereof to the prescribed General Officer and every officer to whom a complaint is made in pursuance of his section shall cause such complaint to be enquired into and shall, if on enquiry he is satisfied of justice of the complaint so made take such steps as may be necessary for giving full redress to complainant in respect of the matter complained of

Crimes and Punishments

Crimes of a similar character are grouped together in classes. They are arranged so as to impress an airman with their relative seriousness

Every crime is charged under a special section of the Air Force Act When not possible then under Sect. 40 which is conduct to the ~~prej~~ prejudice of good order and Air Force Discipline. All crimes are more serious when on active service than when not. In considering crimes the following points will be noted

1 Whether on active service or not
2 Whether deliberate or not
3 Whether with provocation or not
4 Whether on duty or not

Punishments

When considering these ascertain whether the crime was committed

(a) With premediation, without provocation
(b) With premediation with provocation
(c) Without premediation without provocation
(d) Without premediation with provocation

Punishments awarded by G.C.M & F.G.C.M

1/ Death to all ranks (all ranks
2/ Penal servitude, not less than 3 yrs
3/ Imprisonment not more than 2 yrs (all rank
4/ Cashiering (officers only)
5/ Dismissal from H.M. service (officers only)
6/ Forfeiture of rank (officers only)
7/ Reprimand or Severe Reprimand (officers)
8/ Detention (not more than 2 yrs) (N.C.Os & Airmen)
9/ Discharged ignominy (N.C.Os & Airmen)
10/ Forfeiture of pay & fines (N.C.Os & Airmen)
11/ Field punishment (on active service only (N.C.Os & Men

N.C.Os must be reduced to the ranks and officers cashiered before they are sentenced to penal servitude or

imprisonment.

Payment in the Field

A Squadron Commander is responsible for all public money received by him until accounted for as being paid in accordance with the regulation The balance must not exceed 500 francs

How to Obtain Cash

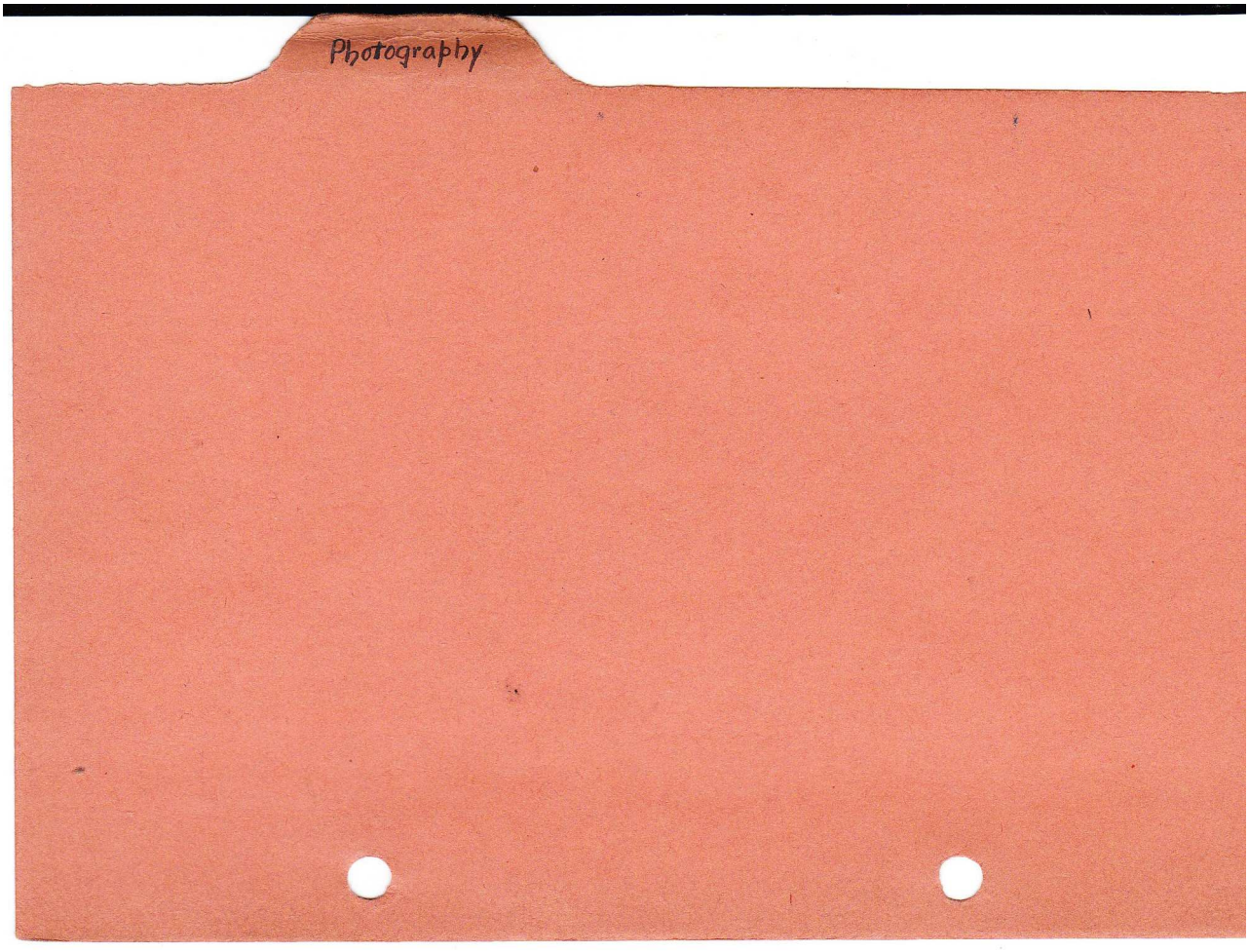
A Squadron Commander completes Army Form W 3100 Requisitions for cash and sends it by an officer to the Field Cashier who hands over the money.

Pay Out

No witnesses are required. The officer signs in the soldier's paybook and the airman signs the aquittance role

Army Book 64

An airman's paybook contains particulars as to the man's qualifications etc also records of payments made and complete and attested particulars as to the rate of pay Army Form W. Aquittance Role is kept in duplicate and given a serial number. The original is sent to the paymaster i/c clearing house, base, immediately after payment The duplicate is kept for 2 months and forwarded to D.H.E. above echelon So the O.C. Squadron furnishes the paymaster with information to make up the airman's ledger accounts and accounts of the expenditure of public money. Army Form N15'318 monthly summary is a simple statement of the money received and expended during the month and is kept in duplicate. The original is sent to the paymaster i/c clearing house base with the necessary vouchers


Photography

Photography

The focal length of a camera is the distance between the centre of the plate and the centre of the lense.

The focal plane shutter is a blind made of dark cloth which has a gap in it which passes across the face of the plate thereby making the exposure.

The light filter is a circular piece of yellow gelatine which is placed in the lense to cut out mist.

Always make your exposures when the machine is flying level

Before ascending the camera should be tested by passing

through one or two plates to insure the changing mechanism is working correctly
Also notice the number on the indicator and see that the full boxes of plates are sealed

Types of Aerial Cameras

	L	EB	WA	BM	LP
Plate	5"×4"	5"×4"	8½"×6½"	8½"×6½"	5"×4"
Focal Length	8" or 10"	20"	10" or 14"	20"	10"
Use	Vertical	Vertical	Vertical	Vertical	Oblique
	Corps & Army	Army Counter Battery	Army Covering Big Area	Corps	Corps

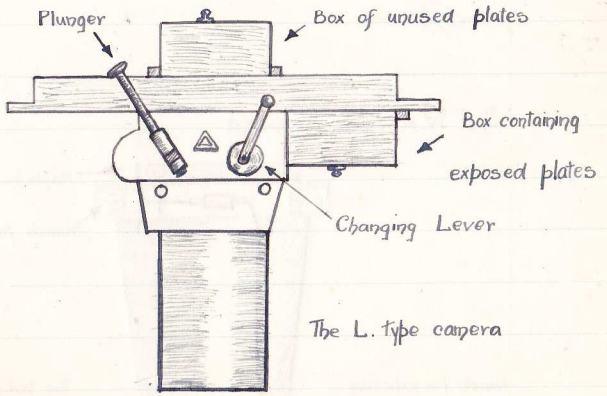
The camera most frequently used in France is the L type camera

The L type camera

On depressing the plunger the light-trap is opened and the shutter released so making the exposure.
When the plunger is released the light-trap closes

The Changing Lever

On the first motion the plate is changed that has been exposed and the shutter reset.
On the second motion the plate indicator is altered and another plate is allowed to fall into position ready for exposure.

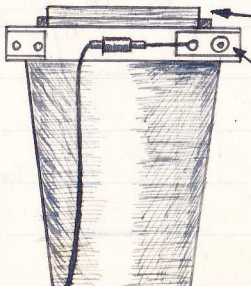


The L. type camera

Changing boxes in the air on L type cameras

1. Close both boxes
2. Take off bottom box which is full of exposed plates and place in a safe place in the machine
3. Remove top or empty box and place underneath as receiving box
4. Take new box of plates and place on top.
5. Open both boxes
6. See both boxes are held into position by their clips
7. See lids of both boxes are clipped

The W.A. type camera.



The W.A. type camera

A vertical photograph is a photograph taken immediately above the object and shows the ground as in plan

An oblique photograph is taken at an angle of 15° below the horizontal and shows the ground in perspective

It is taken at about 1,000 feet above the object and 1,000 yds from it.

To find area covered on plate

$$\frac{\text{F.H. (in feet)} \times 3 \text{ of P (in ins)}}{\text{F.L. (in ins)} \times 5}$$

= Length of one side of area covered

Overlaps

Table showing intervals of exposure giving 1" overlap with an L type camera and flying at 60 M.P.H

A rough rule for 1" overlap flying at 60 M.P.H is 4 secs for every 1,000 ft

Flying Height	Interval
10,000	42
9,000	38
8,000	34
7,000	29
6,000	25
5,000	21
4,000	17
3,000	12
2,000	8
1000	4

In making out a photographic report the items required are the number of plates exposed, height at which exposed, type of camera used, map references and weather report

How to Rectify a Jam in the Air

If the changing lever jams on the first or second movement, if possible force it back to its original position If the camera goes OK. after this the cause of the trouble was a bent sheath or small mechanical defect

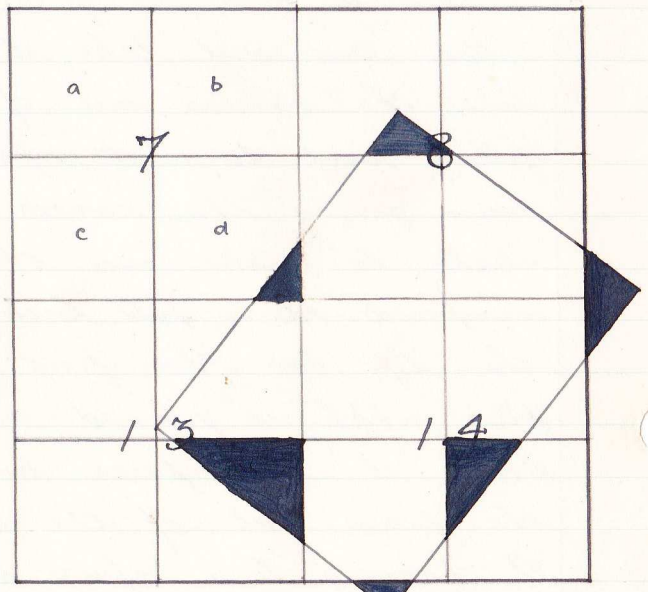
If it does not go OK. and the changing lever will not move use more force. If it goes alright a plate has been broken

If then it does not go OK. close bottom box and take it off Take the camera out of its fitting and turn it upside-down giving the camera a shake to make sure that the unexposed plates fall back into the top box. Then find the plate which is jammed and break it into pieces and pick the pieces out of the camera

If changing lever refuses to move from its original position take the camera out of its fitting

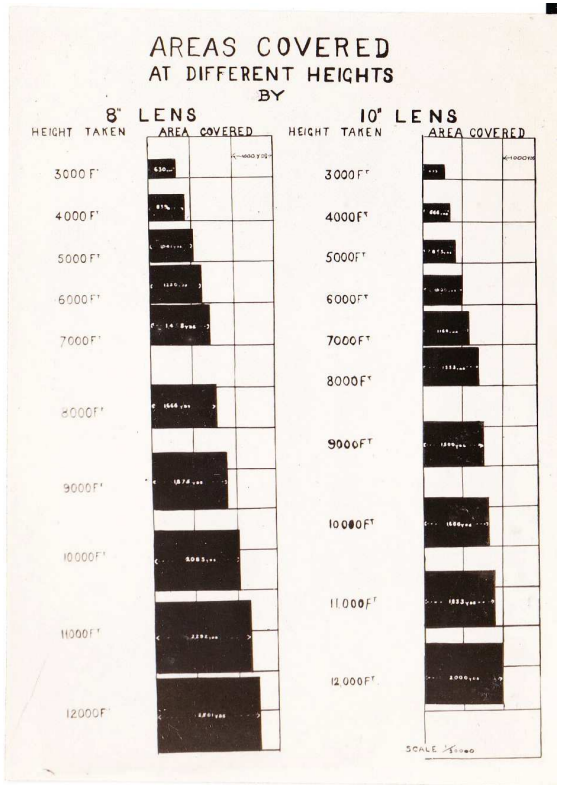
turn upside - down, shake, and close top box

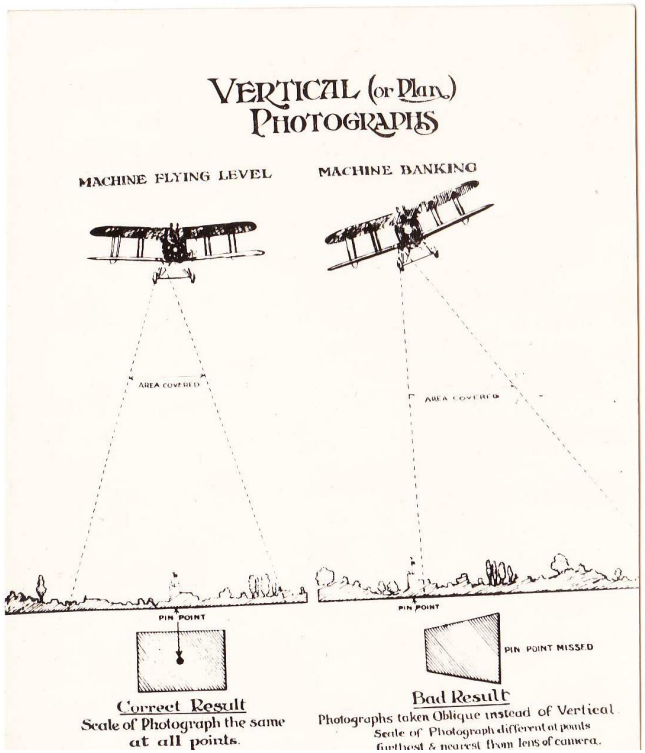
Diagram Showing Correct Method of Determining Area Covered by a Photo on a Map

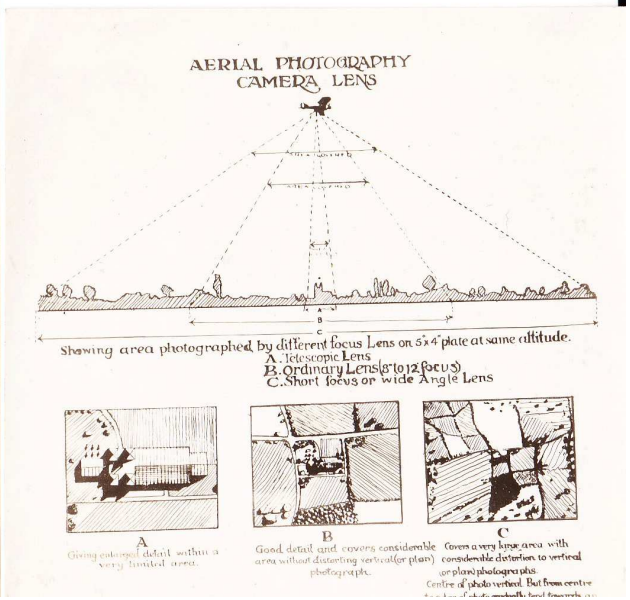


Do not count any portion which does not cover half or more than half of a minor square. In the above diagram the shaded portions will not be counted.

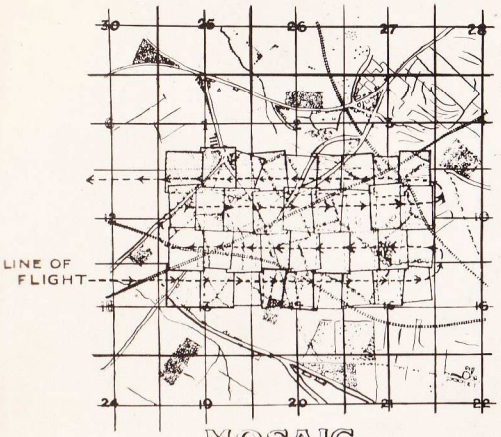
The area covered would be marked thus :- B8cd15b14abc


AREAS COVERED
AT DIFFERENT HEIGHTS
BY
8" LENS
HEIGHT TAKEN
AREA COVERED
3000 FT
4000 FT
5000 FT
6000 FT
7000 FT
8000 FT
9000 FT
10000 FT
11000 FT
12000 FT
10" LENS
HEIGHT TAKEN
AREA COVERED
3000 FT
4000 FT
5000 FT
6000 FT
7000 FT
8000 FT
9000 FT
10000 FT
11000 FT
12000 FT
SCALE


VERTICAL (or Plan)
PHOTOGRAPHS
MACHINE FLYING LEVEL
MACHINE BANKING
AREA COVERED
AREA COVERED
PIN POINT
PIN POINT
PIN POINT MISSED
Correct Result
Scale of Photograph the same
at all points.
Bad Result
Photographs taken Oblique instead of Vertical
Scale of Photograph different at points
furthest & nearest from lens of camera.


AERIAL PHOTOGRAPHY
CAMERA LENS
A
B
C
Showing area photographed by different focus Lens on 5"x4" plate at same altitude.
A. Telescopic Lens
B. Ordinary Lens (8" to 12" focus)
C. Short focus or wide Angle Lens
A
Giving enlarged detail within a very limited area.
B
Good detail and covers considerable area without distorting vertical (or plan) photographs.
C
Covers a very large area with considerable distortion to vertical (or plan) photographs.
Centre of photo vertical. But from centre

Pin points on the map in line of flight should be used as sighting points.



MOSAIC.

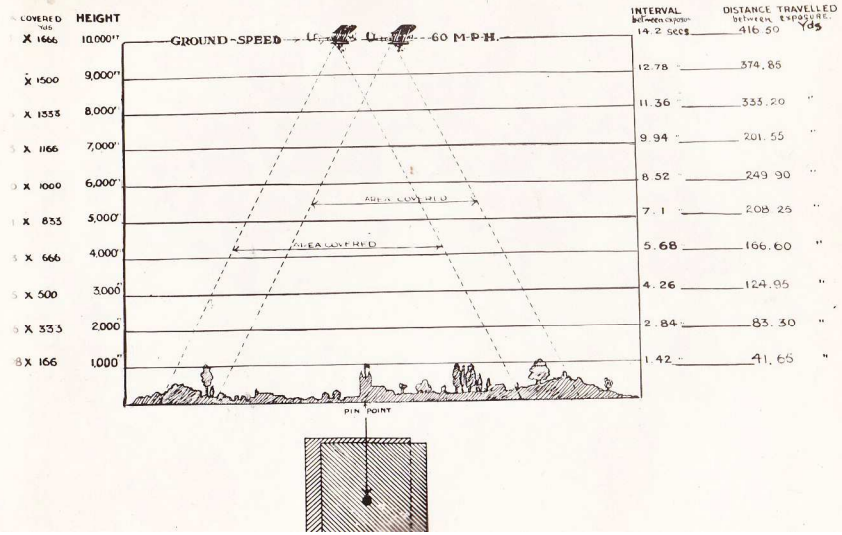
The Photographs should be taken from a height of 6,000 ft and enough margin is left on overlap to allow for wind conditions such as drift when flying into a cross wind etc.

Lines of Overlaps to secure Mosaic photographs.

By the above method the Pilot has practice in.

1 Steering by compass
2 Flying on specified pin points
3 Taking overlap Photographs
4 Completing a Mosaic Photograph in the shortest possible time.

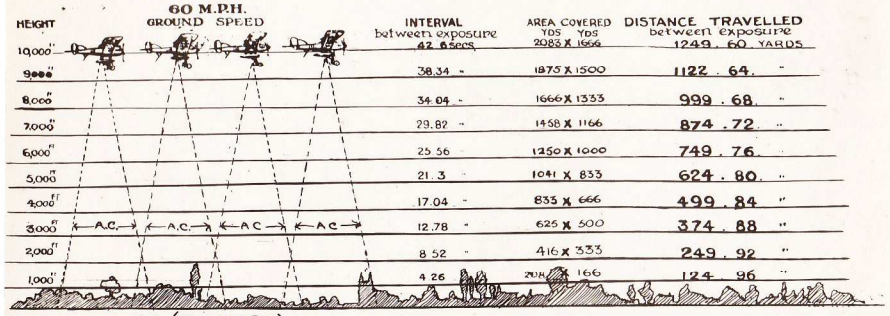
Tables showing intervals of exposure giving 3 inch (overlap on 5"x4" Neg) with 8" Lens FOR STEREOSCOPIC PHOTOGRAPHS.



AREA COVERED YDS	HEIGHT	INTERVAL between exposure	DISTANCE TRAVELLED between exposure Yds
X 1666	10,000"	14.2 secs	416.50
X 1500	9,000"	12.78	374.85
X 1333	8,000"	11.36	333.20 "
X 1166	7,000"	9.94	291.55 "
X 1000	6,000"	8.52	249.90 "
X 833	5,000"	7.1	208.25 "
X 666	4,000"	5.68	166.60 "
X 500	3,000"	4.26	124.95 "
X 333	2,000"	2.84	83.30 "
X 166	1,000"	1.42	41.65 "

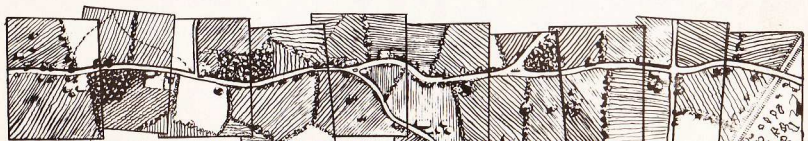
OVERLAP PHOTOGRAPHS

Table showing intervals of exposure giving 1" overlaps on 5x4" plate with 8" Lens.



HEIGHT	INTERVAL between exposure	AREA COVERED YDS Yds	DISTANCE TRAVELLED between exposure
10,000"	42.6secs	2083 X 1666	1249.60 YARDS
9,000"	38.34 "	1875 X 1500	1122.64 "
8,000"	34.04 "	1666 X 1333	999.68 "
7,000"	29.82 "	1458 X 1166	874.72 "
6,000"	25.56	1250 X 1000	749.76
5,000"	21.3	1041 X 833	624.80 "
4,000"	17.04 "	833 X 666	499.84 "
3,000"	12.78 "	625 X 500	374.88 "
2,000"	8.52 "	416 X 333	249.92 "
1,000"	4.26 "	208 X 166	124.96 "

A.C. (AREA COVERED)

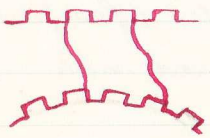


Map Reading

Map Reading.

Conventional Signs.

Trenches



Any trench organised for fire

Communication trench

XXXXXXXXXX Wire entanglements

Ground cut up by artillery fire

Gun (~~Active~~ Inactive)

Gun (~~Inactive~~ Active)

Howitzer (Inactive)

Doubtful (Either gun or howitzer)

Dugout

Gun emplacements

♂ or MG Machine-gun emplacements

⊙ or TM Trench mortar emplacements

Organised shell holes

Aerodrome

Balloon

Railhead

Mine crater (fortified)

Buried cable or pipe line

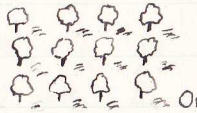
Double railways

Single railways

Trench tramway

Light railway

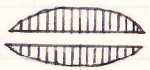
Wood



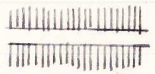
Orchard

Church

Windmill

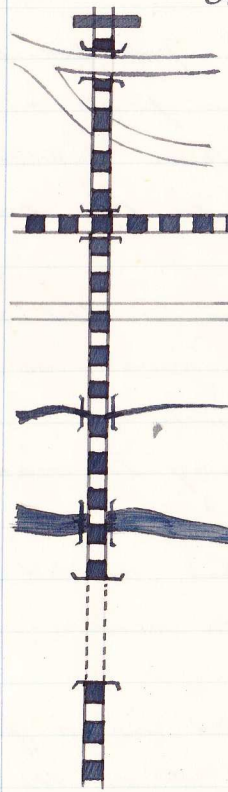


Cutting or Sunken road



Embankment

Marsh



Station

Road over Railway

Railway over Road

Railway over Railway

Level Crossing

Railway over Stream

Railway over River

Tunnel

Scales

A scale shows the proportion that the distance between two points on a map bears to the distance between the same two points on the ground

1 It can be shown on the map by a statement in words as six inches to the mile

2 By the R.F It may be marked on the map that R.F $\frac{1}{20,000}$

3 By a scale line divided into parts each representing a certain number of units

R.F means represented as a fraction

R.F $\frac{1}{100,000}$ means 1 inch etc on the ground map equals 100,000 inches on the ground.

The Representative Fraction is one whose numerator bears to the denominator the same proportion that the distance on the map bears to the distance on the ground it represents.

The numerator must always be one and the denominator is always expressed in similiar terms

Example

To find R.F and construct a scale of yds when $3\frac{3}{4}$" represents 1,500 yds

$3\frac{3}{4}$" reps 1,500 yds

$$R.F = \frac{15}{4} \times \frac{1}{1500 \times 36} = \frac{1}{14400}$$

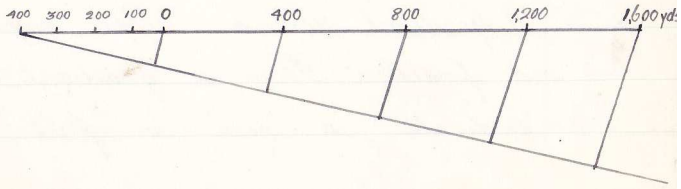
$$R.F = \frac{1}{14400}$$

If 1,500 yds = $3\frac{3}{4}$"

2,000 " = $\frac{2000 \times 36}{14400}$

= 5"

2,000 yds = 5"



Contours

A contour is an imaginary line running round the ground at the same height all the way round, each contour representing a fixed rise or fall of a certain number of feet.

The Vertical Interval is the vertical height of one contour above another. The V.I. must always be stated on any map.

The Horizontal Equivalent is always expressed in yards. It means the number of yards measured horizontally which corresponds to any degree of slope, the V.I being fixed.

The H.E. may be said to be the distance in plan between two contours.

A Gradient is a slope expressed as a fraction. Thus a gradient 1/30 indicates a rise or fall of 1 foot in every horizontal distance of 30ft.

A Section is the representation of the outline of a hill exposed by its intersection of a vertical plain in any direction.

The Datum Level is an assumed level with reference to which heights are measured or compared or shown in section.

It is usually but not necessarily the lowest point in a sketch.

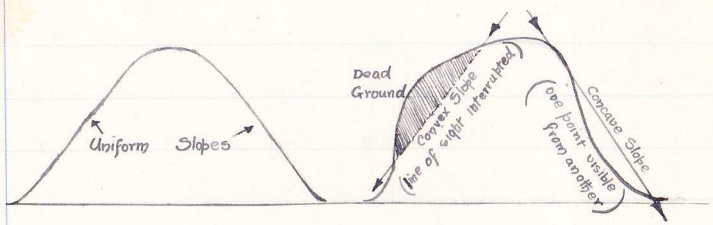
Slopes

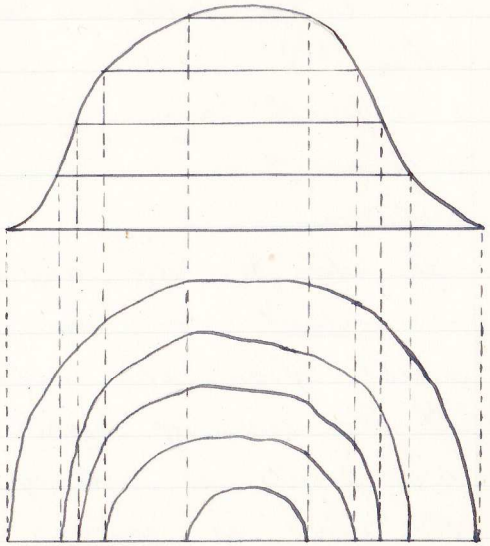
1. Uniform
2. Concave
3. Convex

The slope between any two points is concave when one point is visible from the other.

If the line of sight between any two points is interrupted then the slope is convex.

All convex slopes have parts called dead ground which conceals the movement of troops and cannot be controlled by rifle fire





Artillery Maps

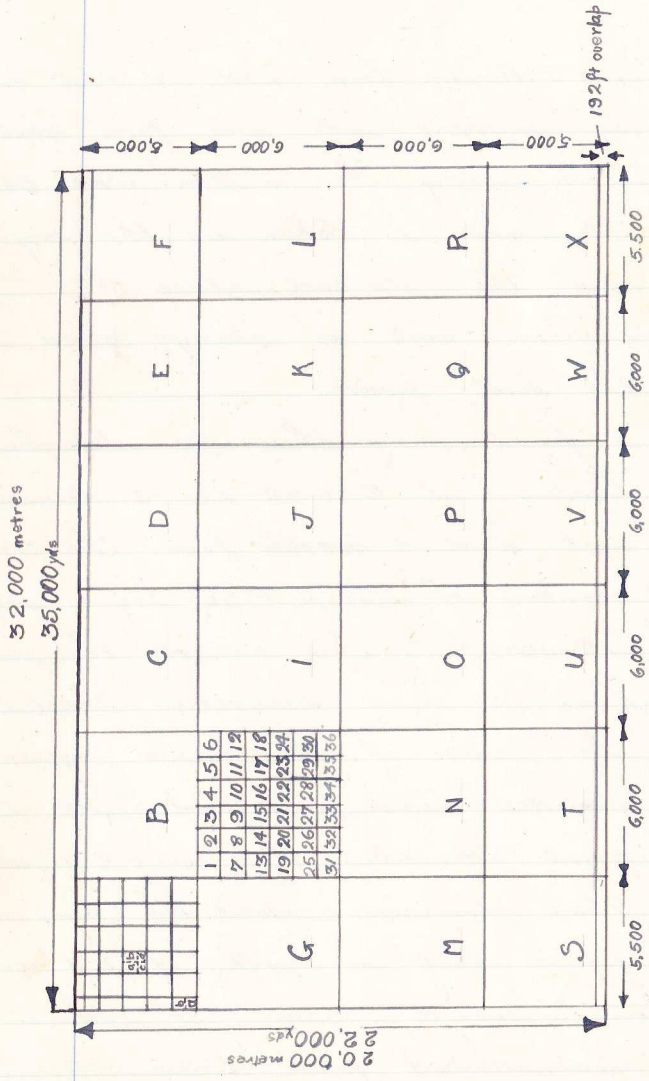
System of Squares.

Over the map has been placed a grid showing squares of 1,000 yds. This is merely for convenience in indicating localities and obviously cannot fit exactly with sheet lines which are in terms of metres.

The grid has therefore been placed with its central point in the centre of ~~1~~/40,000 sheet and allowed to overlap the sheet lines along the edges of the map.

It will be seen from the diagram that in the west the subsquares lettered * a ? c are missing bringing and making east and west grid lines very nearly coincide with the sheet lines the overlap being the distance between 7,500 ? 16,000 yds (half the length of the sheet)

This is only 6·5ft and is covered by the thickness of a single line on the map so that for all practicable purposes it is negligible.
At the north and south edges however we get an overlap which is the difference between 10,000 metres and 11,000 yds (the nearest grid line). This overlap amounts to 192 ft and appears on all large scale maps.
The large rectangles on a map lettered A to X are divided into squares of 1,000 yds side which are numbered 1-30 in squares A to F, S to X and 1-36 in squares G to R
Each of these squares is sub-divided into 4 minor squares a,b,c,d.
A point may thus be described as lying within square B6 or M5 etc
To locate a point in a minor square consider the sides divided

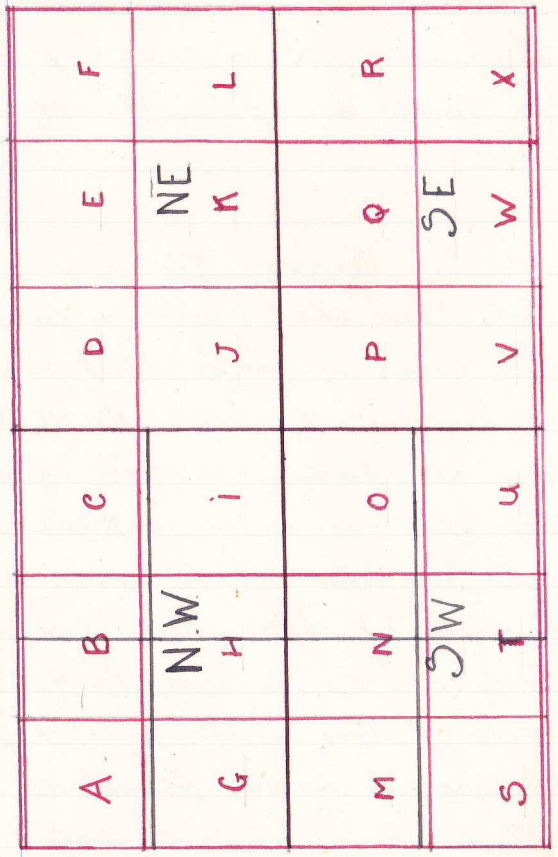


Artillery Map

into tenths from west to east along the southern side and from south to north along the western side. The S.W corner is taken as the origin and the distance along the southern side is always given by the first figure.
A point may thus be described as located at M5b 34 i.e. 3 divisions east and 4 north from the SW corner of square M5b. By a simple extension of this method the point may be more accurately located if the sides of the minor squares be divided into a 100 parts and the point described by using 4 figures.
These distances represented by 1 or 2 figures east or north of SW corner are called square co-ordinates as distinguished from trignometrical co-ordinates. Care must be taken when describing a point in a square which falls at the top or bottom of the sheet (where the grid may overlap the sheet edge) to measure co-ordinates from grid line and not from the edge of the sheet.

The 1/20,000 Map

Each 1/20,000 sheet covers a quarter of the area of 1/40,000 sheet and is is identified by letters N.W. N.E. S.W. S.E. noting its position on 1/40,000 sheet.
1/20,000 sheet is called 1/28 NW etc
Each 1/10,000 sheet again covers 1/4 of the area of 1/20,000 sheet and is identified by numbers 1.2, 3.4.
Maps of 1/5,000 scale are prepared for special areas, for schools on villages and contact patrol



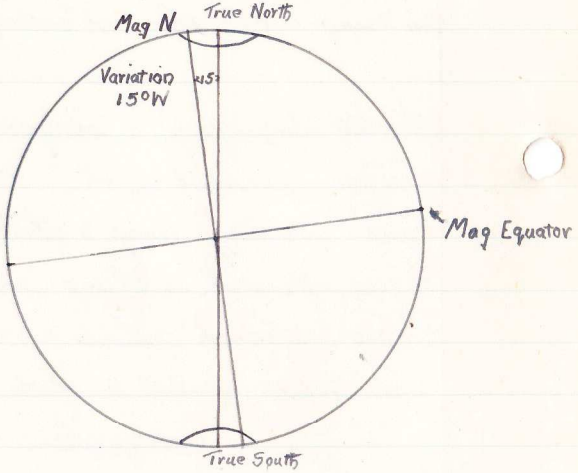
The following is a summary of maps in use on the Western Front.

1/250,000. Long recon. & strategical 1" = 4 miles
1/100,000 General work 1" = 1·5 miles
1/40,000 Artillery map & short recon. 1·58" = 1 mile
1/20,000 General artillery work 3·16" = 1 mile
1/10,000 Trench shoots 6·33" = 1 mile
1/5,000 Contact patrol & shoots on villages 12·67" = 1 mile

Dimensions

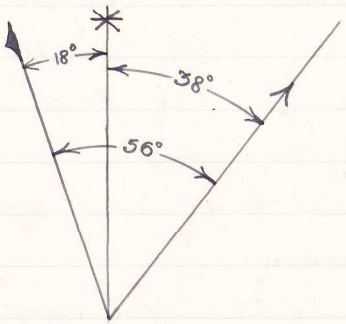
1/40,000 - 35,000 x 22,000 yds grid 35,000 x 21,872 yds sheet
1/20,000 - 17,500 x 11,000 " " 17,500 x 10,936 " "
1/10,000 - 8,750 x 5,500 " " 8,750 x 5,468 " "

The Compass

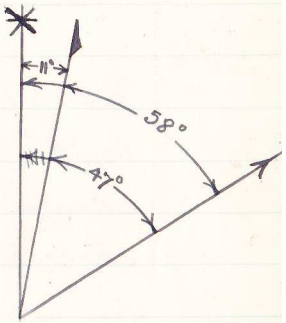


Variation is the horizontal angle between the magnetic and true north.
When the variation is west the magnetic is best and when variation is east magnetic is least

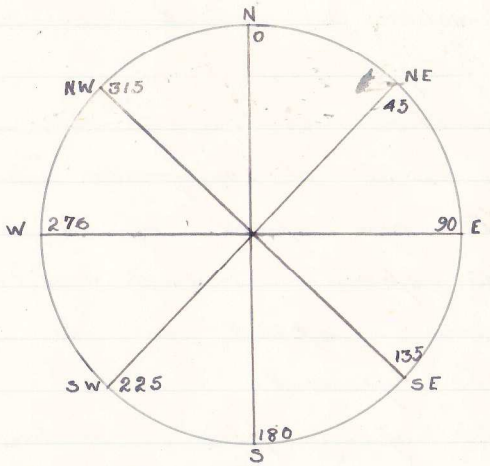
L to true N	Variation	Course in which flying
195	183	12°E
326	336	10°W
58	47	11°E
226	241	15°W



18°W + 38 = 56°



58 − 11° = 47°



To find the back bearing of a place add 180° up to 180° and subtract 180° over 180°.

back bearing of 45° = 45+180 = 225°

" " " 315° = 315-180 = 135

The lubber line is fixed on the bowl of the compass and is always set fore and aft of the machine

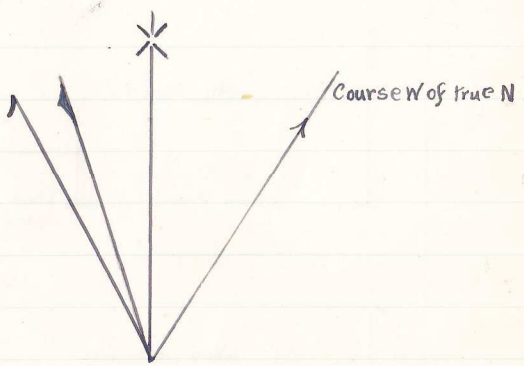
The reading on the card which is against the lubber line is the direction in which the machine is flying.

Deviation is always measured east or west of magnetic north.

The air speed of a machine is its speed through still air and ground speed is its speed over the ground.

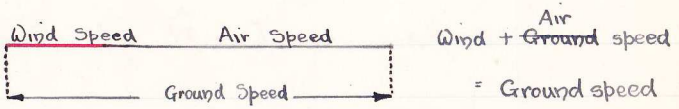
Air speed plus or minus wind speed is the ground speed.

Deviation is the horizontal angle between the magnetic and compass meridians varying E or W as the compass is E or W of true N.

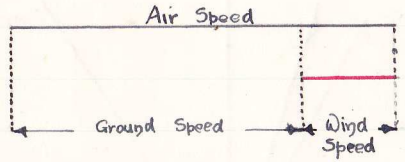


Deviation Table.

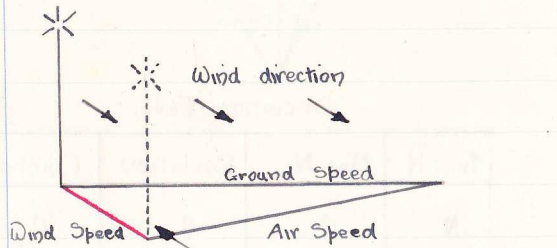
True N	Mag N	Deviation	Compass
N	0	0	0
NE	45	4W	49
E	90	1W	91
SE	135	5E	130
S	180	2E	178
SW	225	7E	218
W	270	2E	268
NW	315	3E	312

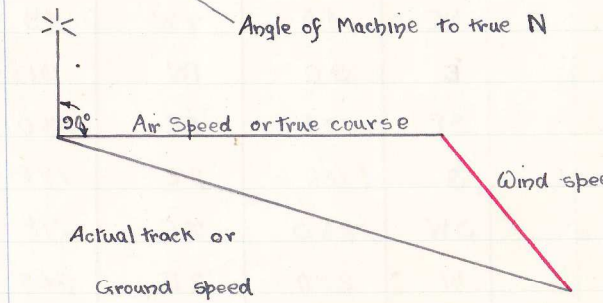


Wind + Air speed
= Ground speed

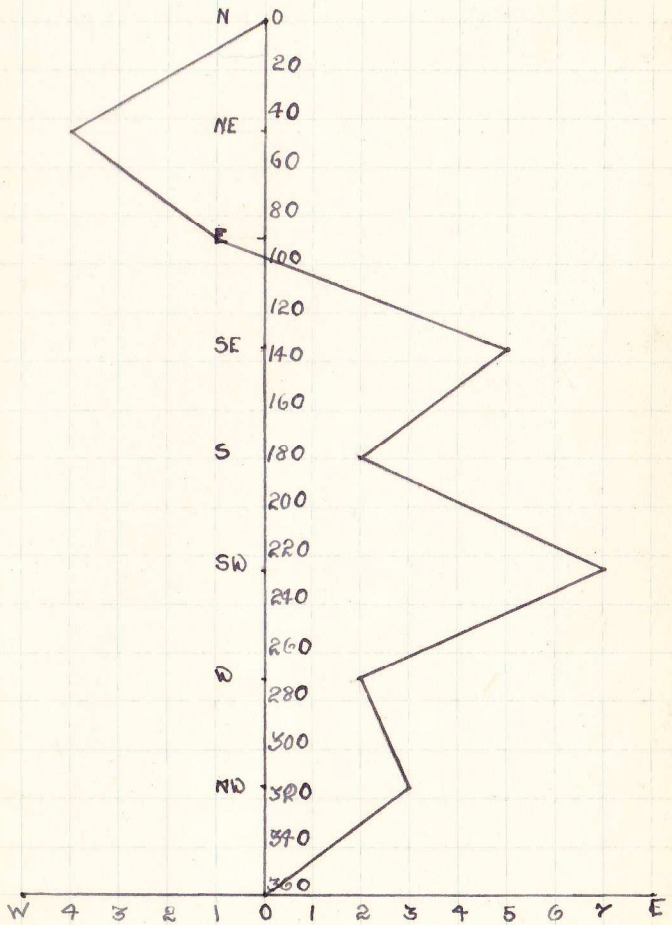


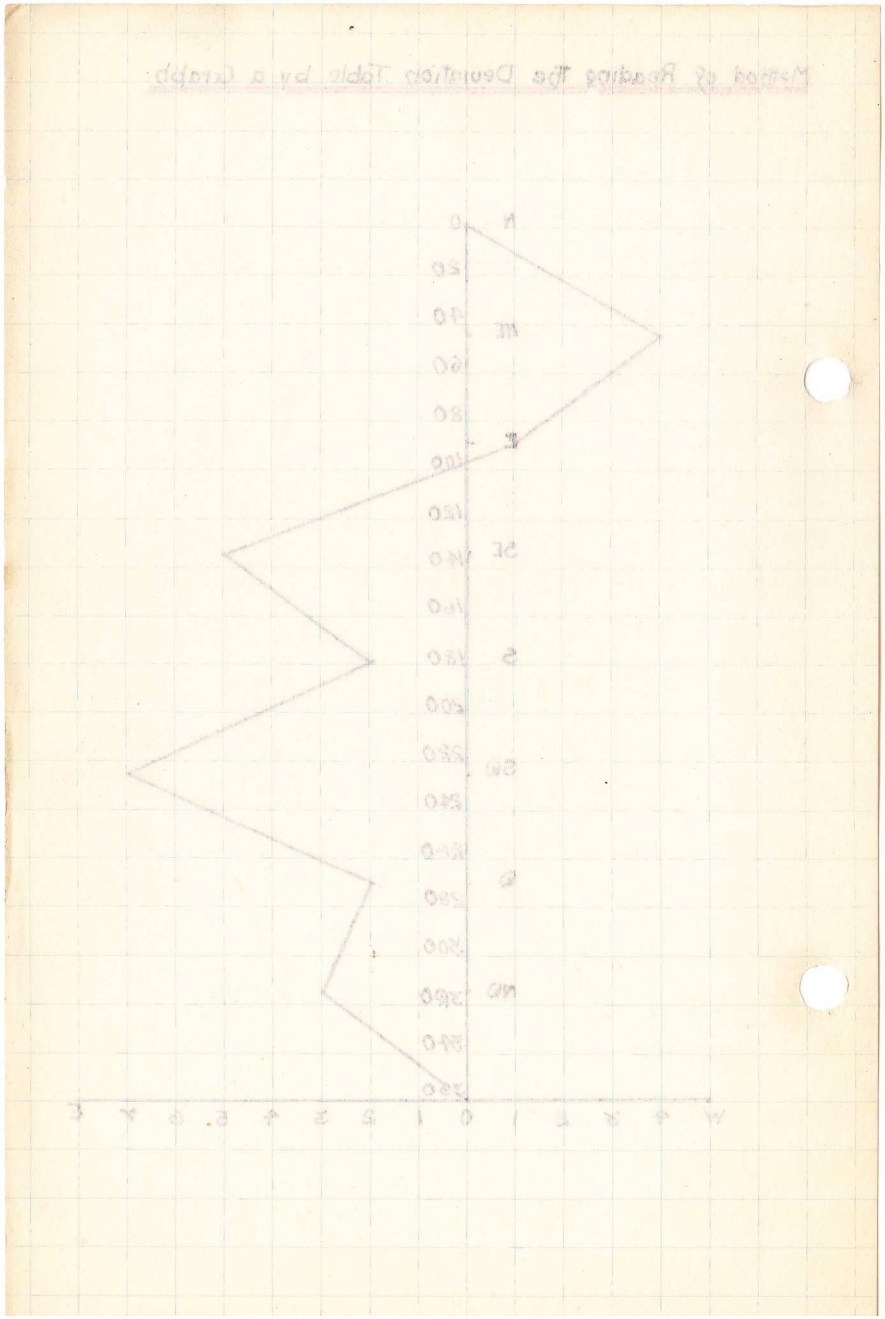
Air − Wind speed
= Ground speed





Method of Reading the Deviation Table by a Graph





Charts

Poles. The Equator is a great circle between the poles

The Meridian is a semi-great circle joining the poles

Longitude is the arc of the equator from the meridian of Greenwich to the meridian of the place.

Latitude is the distance of a place north or south of the equator.

Parallels of Latitude are small circles parallel to the equator.

The Great Circle Any plane passing through the centre of the earth cuts the earth at the great circle

The shortest distance between any two places on the earth's surface is along the arc of the great circle joining them.

The Small Circle Any plane not passing through the centre of the earth cuts the surface at the small circle.

1 min = 1 sea mile or 6080 ft

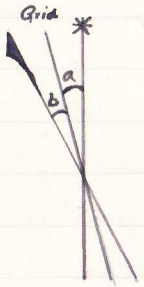
1 knot = 1 " "

The North Point

In any system of rectangular sheets as soon as a point is reached far from the origin on which the system is based the vertical lines no longer point N & S The inclination to the sheet lines of the meridian of longitude that is true N or grid error increases with the distance from the origin Hence the vertical sheet lines of our large scale maps which are all rectangular are not true N & S On sheet 28 for instance the angle between the sheet line and true north is 1° 04'.

It is necessary to consider this inclination only when plotting bearings taken with a magnetic compass. All bearings and direction fixed instrumentally by a survey

compass are given with reference to grid or sheet lines
This may conveniently be referred to as grid north.



a - Grid error 1° 04'
b - " variation 12° 30'
a+b - Mag. variation 13° 34'

How Maps are Set

A map is said to be set when it is laid out to correspond with the ground so that true north on the map points to the north pole.

1/ With a compass

If the magnetic north is shown on the map lie a compass over it and without disturbing the compass turn the map slowly round until the north end of the magnetic point on the map is exactly under the north end of the needle In doing this it may be necessary to make an allowance for any special variation of the compass If only the true north line is shown on the map place the compass with its centre on the true meridian and turn the map until this line makes with the needle an angle equal to the variation and on the correct side of it.

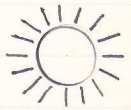
2/ By Objects

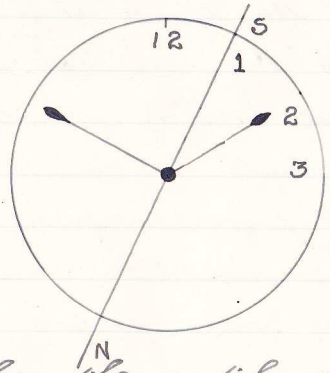
A map may be set by objects on the ground without using the north point or compass, as follows
(a) When you can identify a position on the map, identify a position on the ground where you stand as some point marked on the map

Also identify on the map some distant object you can see. Join these two on the map by a straight line. Then turn the map about point marking your position till this line points to the distant object.

(b) When you do not know your exact position. Place yourself between or in prolongation of a line joining any two points which can be identified. Revolve the map until the line joining the two points on the map points towards the two positions on the country. The map is then set. A map be set approximately for reading by identifying on the map several prominent objects that can be seen, or by standing on or near some straight feature marked on the map, such as a straight road, railway, river, canal, etc. The map is then held so that the direction between these objects as they appear on the ground and on the map are parallel to one another

Setting a Map by a Watch





Place the watch so that the hour hand points to the sun. Then the line that bisects the angle formed by the hour hand and the 12 points N and S

Datum Level. An assumed level to which altitudes are referred.

Air Force Organisation
and
Aerial Navigation

Duties of an Orderly Officer of R.A.F. in France

The squadron duties of an orderly officer in France which are other than usually the duties of an infantry officer.

1/ To stay overnight for the whole tour of duty in the recording offic.
2/ To receive all telephone messages wires etc., and attend to all correspondence in the absence of the Commanding Officer
3/ To receive all weather reports and see that pilots and observers concerned are duly informed
4/ He is responsible for putting out the landing T by day and flares by night

5/ He is responsible for all strange machines landing in the aerodrome

The ordinary duties of an Orderly Officer

On joining a battalion unless of the rank of captain and above an officer may be detailed for the duties of an orderly officer
To commence with he will be supernumerary to the orderly officer detailed for the day
Officers detailed for orderly officers for the day and next day and supernumerary orderly officers appear in Part I orders.
His tour of duty is from reveille to reveille.
The first day in a garrison if stated in part I orders is ration board.
The time and place where this will be held is notified in Part I orders
The Orderly Officers of various units in a garrison + the garrison captain of the week assemble at the ration store inspect the rations and satisfy themselves that they are good and fit for human consumption
They will then sign the book in the ration store to that effect.
Next he will inspect the men's breakfast in company with the battalion orderly sergeant or corporal

Proceedure

The orderly sergeant or corporal knocks at the door and calls out "Orderly Officer". The orderly man of that room stands up. The Orderly Officer will ask "any complaints"?

and will go round and look at one or two of the men's breakfasts and will satisfy himself that the men are getting sufficient and breakfasts are in order

He will next tell the orderly sergeant to report to him at a fixed time arranged by himself. He will then go to his own breakfast.

He will attend the Commanding Officer's orders and receive any instructions the Adjutant or Commanding Officer may wish to give. After the CO's orders the Orderly Officer meets the orderly sergeant and corporal and goes round to inspect the Regimental Institute, libraries, reading rooms, tailor's shops, boot maker's shops, cook houses, detention rooms, latrines, ablution rooms etc

Reference

Detention Rooms

The Orderly Officer will see the prisoners and ask if there are any complaints and see that everything is in order

Should there be any prisoner who has been in the detention (room) and a charge has not been furnished up to 48 hrs the Orderly Officer has the right to liberate that man according to the KR.s 463 and he will notify the Adjutant to that effect.

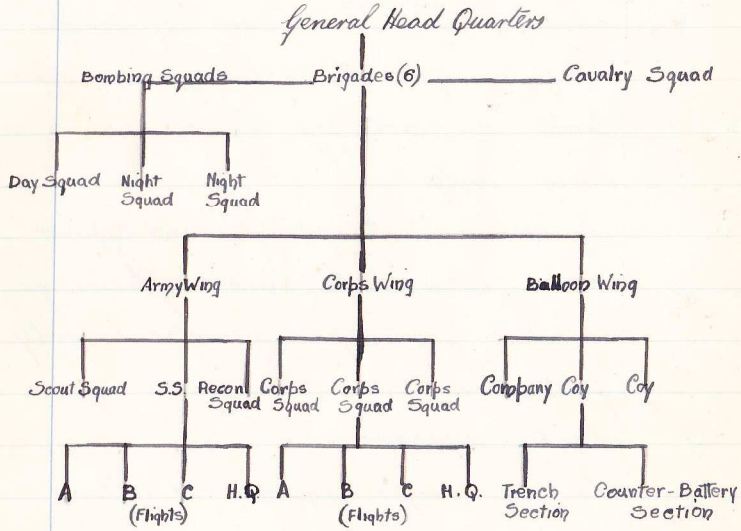
He will be present at the issuing of rations and see they are weighed out correctly and the right amount issued to the company.

He will test one or two of the weights i.e. meat, sugar, tea, &c. and see if they are correct
If the guard is mounted in the afternoon he will mount the guard inspect them and order the various guards such as quarter guard headquarter's guard water-works guard or any other guard of that particular unit to march off the parade ground.
He will wait until the guards have been relieved
They will be marched back to the battalion parade ground inspected and the ammunition collected and handed in to the Quarter-Master and dismissed
During he tour of duty he will not leave barracks or camp except on duty.

He will answer for the Commanding Officer or Adjutant when they are out.
He will see that the appliances for precautions against fire are properly in order.
He will not inspect men's teas unless specially ordered to do so by the Adjutant.
At Tattoo Staff Parade all the company orderly sergeants report to the R.S.M. the number of absentees.
The absentee reports are collected by the orderly officer and the names entered on the orderly officer's report.
There is a form obtainable from the Adjutant called the orderly officers report which he must get and fill in

He will see lights out and go around the barracks to see that everything is in order and quiet and windows are half open. If anything unusual occurs during the night such as fire etc., the orderly officer sees that the Commanding Officer and Adjutant are aroused and he takes charge of the operations He will furnish his report to the orderly room before the Commanding Officer's orders next day

Air Force Organisation in France



The Personnel

General Head Quarters – Major-General and staff

Brigade – Brigadier-General, Brigade Major, Staff Captain and first class equipment officers for machine-guns wireless and photography

Army Wing – Lieut-Colonel, Adjutant and second class equipment officers

for stores and photos and one for wireless in the case of corps and army wings. An intelligence officer and an artillery liason in a corps wing only.

Squadron - Major, Record Officer and third class equipment officers for wireless in Corps squadrons only but for stores and machine guns in both squadrons.

In a corps squad. artillery and liason officers

Balloon Company - Major

Balloon Section - Captain, first and third class equipment officers for wireless and stores

The aircraft park - Major - supplies spare parts and new engines

The Supply and repair depot - Colonel

Aircraft

1 Heavier than air - aeroplanes

2 Lighter than air - balloons

Balloons

1 Kites

2 Free

Aeroplanes

1 They can be controlled in the air

2 They have a power of motion in engine

3 They are capable of slow or fast speed

4 They have stability in all weather

Balloons (Airships)

1 They can be controlled

2 They have the power of motion in the engine

Kites

They have no movement

They are all limited by the weather conditions

Airships are used for offensive and defensive purposes while

kites are used for observation only.

In the scout squadrons attached to the Army Wing the machines are single seaters and in the reconnaissance squadrons the machines are (~~single~~ two) seaters.

Single Seaters machines	Two Seaters
S.E. 5	Bristol Fighters
Camels	De Havillands No 4
Nieuports	
Dolphins	
Corps Wings	
S.S Machines	
Reconnaissance + Experimental No 8	
Armstrong Whitworths	
Bristol Fighters	

Table of Heights

S.E.5 Dolphins	15,000 ft
Spads	12,000 ft
Camels	9,000 ft
Nieuports	6,000 ft
D.H.5	3,000 ft

Wireless Telegraphy

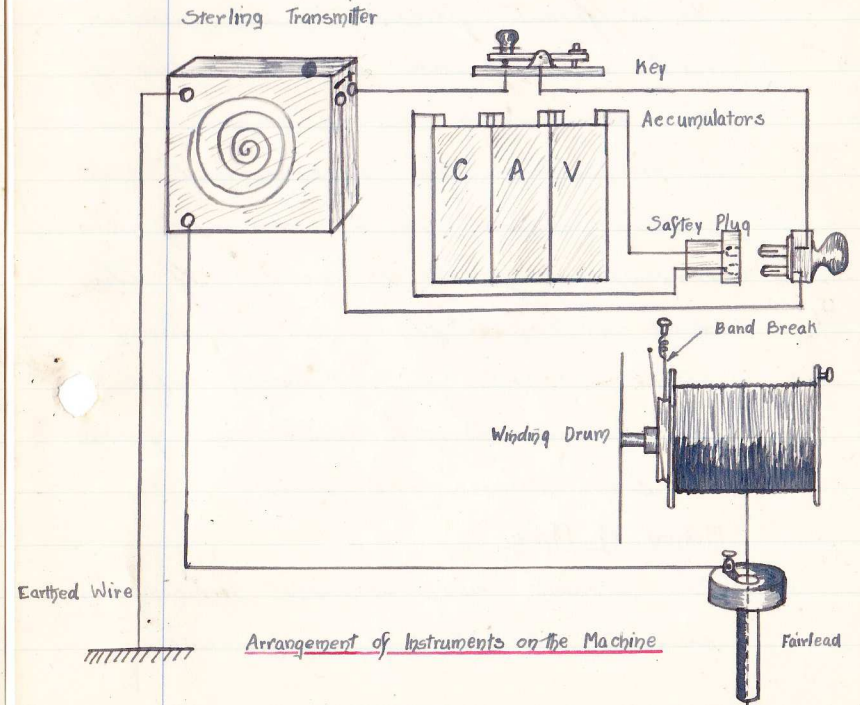
The safety plug is a controlable device inserted in the two main leads of the accumulators. When the plug is withdrawn the cells which are the only normally active part of the set are entirely isolated from the rest of the circuit. Except for testing purposes the plug must never be in when

(a) The machine is on the ground

(b) When the aerial wire is wound

on the drum
In the case of a false landing the withdrawal of the plug should be the observer's first consideration
The aerial wire when not in use is wound on the aerial drum At its free end a 2 lb lead weight is provided for unwinding purposes It must never be unwound without the application of the band brake on the drum If this is not done the momentum gained by the lead weight will be sufficient to carry the aerial away from its fastening.
It should never be unwound at a height of less than 500 ft.
The fairlead is a brass tube through which the aerial runs from the drum

Connection is made with the transmitter by a brass terminal fixed to the tube and an insulated wire running from this to the aerial terminal
The tube is encased in ebonite to prevent loss of energy by diffusion or short circuiting

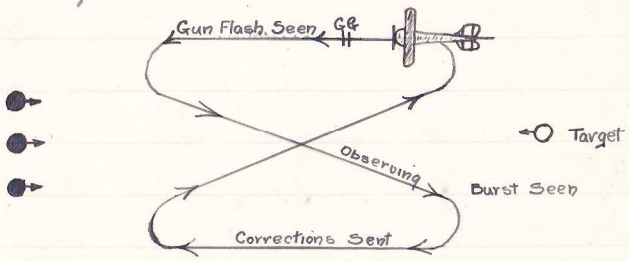


Arrangement of Instruments on the Machine

The fairlead has three uses
1 It guides the aerial
2 It insulates the aerial
3 It connects the aerial to transmitter
The earth connection is made from the earth terminal on the transmitter to the cross-bracing wires of the machine.
The different flights in a squadron work on seperate wave lengths. If the transmitter on a machine is set to 180 metres the receiver at the battery must make an adjustment corresponding to 180 metres. If this is done interference from machines of other flights is obviated when the wave length used is greater or less than 180 metres.

Method of Flying

The signals are strongest when flying towards the battery and weakest when flying away from it. Flying at right-angles to the battery gives medium signals. If signals are sent when banking or turning they will be entirely inaudible at the ground station.
The following diagram suggests a convenient method of flying when carrying out a shoot and making use of various directive effects already mentioned.



Precautions to be Adopted for Successful Wireless Results

1 Before flight examine the wireless thoroughly and see that all connections are good and make the following

tests

(a) Insert safety-plug and depress key If a high-pitched buzz is heard the transmitter and its various circuits are in working order

(b) Keep key depressed and touch the aerial with any small metal object If a small spark is observed on contact, radiation can be taken as being OK. Then withdraw the safety plug.

2/ After taking off and attaining a height of 500 ft gently release the aerial making use of the hand brake

3/ After calling your battery up carry on with the shoot flying in the manner laid down for strongest signals. Never send on a turn, when banking or when flying away from the battery

4/ Send messages sharply and crisply keeping to the proper group sequence.

A quick crisp signal is easily read, is less tiring for the operator, does not jam the other signals and is not easily jammed

5/ Only authorised code signals should be used. No messages clear unless absolutely necessary

6/ After finishing the patrol withdraw the safety plug and re-wind aerial steadily and evenly.

Reconnaissance

A reconnaissance may be defined as the practice of obtaining information of military value when flying over enemy territory

Distant Reconnaissance is done by the GHQ Squadrons up to 150 miles (DH9)

Long Reconnaissance is done by the Army Squadrons up to 60 miles

Close Reconnaissance is done by the Corps Squadrons up to 6,000 yds

The object of reconnaissance is to keep the staff informed of the enemies movements and of his future movements

Record facts only

The Independent Air Force does the long distance bombing (Major-General)

Detail of Work of Corps Squadrons

Two flights do counter-battery work the other trench work.

Counter-Battery Work.

Spotting hun battery positions

Contact Patrol.

To keep into touch with the advancing troops and report on their progress, report on enemies movements and assist the attacks on the enemy.

Photos are taken by Corps Squadrons to keep the artillery maps up-to-date

Artillery Reconnaissance is the reconnaissance of the enemies artillery positions.

Trench Reconnaissance is the recon. of the enemies trench lines.

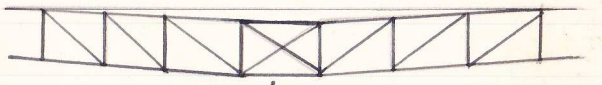
Points to Note in a Reconnaissance

Trains. Pin-point of the engine and direction in which travelling, kind and number of coaches

Troops. If in column give the pin-point

Aeroplanes

Two main types of machine the Tractor and Pusher type.
The Pusher type machine has its propeller at the rear of its lifting surfaces and the Tractor in front
These two types may be again divided into three classes:-
Biplane. which has 2 lifting surfaces
Monoplane .. .. 1 .. ..
Triplane .. .. 3 .. ..



Flying wires run outwards and upwards and are to prevent the planes from collapsing when in flight.
Landing wires run downwards and