

Machine Gun

The Lewis Gun

General Description

Lewis Gun. .303 gas operated air cooled. Weight of ground gun 26 lbs aerial gun 17 ½ lbs. Magazine empty 3 ¾ lbs full 8 lbs 14 ozs. Double magazine contains 97 rounds. The gun is worked by two forces

- (a) force of gas caused by priming of the cartridge.
- (b) by return spring mechanism

Backward movement

- 1/ Action of gases
- 2/ Action of piston rod and return spring
- 3/ Action of bolt and extractors
- 4/ Action of ejector
- 5/ Action of feed arm and pawls
- 6/ Action of magazine
- 7/ Action of sear

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 muzzle 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 1 1/8" 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 and the winding up of the return spring commences. This 1 1/8" travel is a safety 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 1/8 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 oscillating stud 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 base on the oscillating 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/ Brimming of the cartridge

During the forward movement the magazine does not rotate.

- 6/ Action of the 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 amway 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 posts bears against the curved camway. This causes the bolt to rotate 1/8 of a turn to the right and legs 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 loss on the oscillating 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 stop pawl and forces it out of action. The left stop 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) Don't use ordinary g.s as it gets sticky in cold air.

(c) Use P 9.2.4 In very hot weather a mixture of P924 and g.s. oil may be used

2/ Oil sparingly as too much oil cause stickiness in cold weather

3/ Method of oiling. Use a camel hair brush, failing this use a pad of 4" x 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 ejector 11/ Ribs on body cover

To clean

1/ Barrel (a) with bolt and pistons in position. Pull back cocking handle till the sear engages. Insert a piece of 4" x 2" in the eye of the cleaning rod and cover it with oil. Push the rod into the barrel from the muzzle and pass it up the barrel until it is clean. Initially pass an oily piece of 4" x 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 gauge and drop the weight down the barrel from the breech end. Have the gun held and pull the cord backwards and forwards until the barrel is cleaned. Before firing remove the oil by pulling through a clean piece of 4" x 2".

e/ If the gun has fired more than 600 rounds pour boiling water down the barrel then reoil.

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 of carbon deposit by scraping with a knife.

Testing Ammunition

Examine each round for

- (a) Misshape or split cases by inserting a spare new barrel and by eye.
- (b) Thick rims by pushing through a Vickers 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
- (3) Deflector bag if used
- (4) Cocking handle correctly fixed
- (5) Return spring weighed and correct tension
- (6) Cartridge guide spring acting as a spring
- (7) See sights are correctly fixed
- (8) Fire in a short burst into the ground
- (9) 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 pawel spring

Tools

- (1) Screw driver
- (2) Spring balance
- (3) Toggle for pulling back cockring 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) East 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 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 coching 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 head foresight are so harmonised that the object covered by the head 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 cross is the right-sight in duplicate.

The Photo Teaches

- (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 in 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 40 ft length 20ft. stop with two-seater span 35 ft length 25 ft
 - b. Value of the space between two circles at 200 yds which is 8 ft 80ft divided 10 space = 8 ft 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 divided by 8 = 5 spaces are covered at 200 yds 4 spaces are covered at $200 \times 5 \times 4 = 250$ yds

No 1 The Ring Sight

- (1) Evolution of Sights
 - a. Battle sight:
 - b. La Prier
 - c. CG sight
 - d. Improved CG
 - e. Ring sight

No 2 Deflection

- (a) Speed of bullet
- (b) Speed of enemy machine
- (c) Deflecting automatically allowed for by sight
- (d) Projection of ring sight gives correct deflection

DIA I

No 3 Rules

- (a) Bead of foresight must be kept centrally situated in the inner ring of the back sight

No 4

- (b) The eye must always be kept at the correct distance from the centre of the ring-sight (i.e.) 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 III

No 6 Speed of Enemy machine

- (a) Average 100 mp.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..
- (c) Improved C.G.
- (d) Norman Compensating Foresight

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

No 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

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 ward extra guards and piquets for offences on those duties and find for drunkenness. 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 DRUNKNESS

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 drunkenness 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 drunkenness is not being 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 reprimand 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:-

(e.a) Summary Punishments

(e.b) Minor “

Summary Punishments

- (1) Detention up to 28 days
- (2) Fines for drunkenness up to 10/-
- (3) Deductions from ordinary pay to recover loss or damage
- (4) Field punishments 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 severely reprimand an N.C.O

He may award extra guards and piquets for offences on those duties

He may award 14 days CB.

He may order an acting or temporary N.C.O to revert to his permanent rank

In cases of absence without leave he can ward 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, implicit 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)

He may quit his quarters for exercise within confined limits and not 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 of an airman also means arrest close or open.

In close arrest he is placed in confinement under guard when he will be searched and deprived of any weapon.

In open arrest he is confined to barracks, attends all parades, is not detailed for duty and does not bear arms except

a/ By order of the Commanding Officer

b/ emergency

c/ Line of march

Close Arrest

An airman can only be placed under close arrest in cases of

a/ Drunkenness

b/ Violence

c/ Insubordination

d/ When necessary to ensure his safe custody (desertion)

Disobeying an order distinctly given means close arrest and confined to the guard room at once. The N.C.O. ordering the arrest will obtain an escort of one or more privates.

A lance-corporal of under 4 yrs service will report the case to the orderly sergeant.

Address of Wrongs

If an officer thinks himself wronged by his CO 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 examine 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 an 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 complaint 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 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

- (c.a) With premeditation, without provocation
- (c.b) With premeditation with provocation
- (c.c) Without premeditation without provocation
- (c.d) Without premeditation with provocation. Punishments awarded by G.C.M & F.G.C.M

- 1/ Death to all ranks
 - 2/ Penal servitude, not less than 3 yrs
 - 3/ Imprisonment not more than 2 yrs (all ranks)
 - 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 punishments (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 55frances.

How to Obtain Cash

A Squadron commander completes Army Form W. 3100. Requisition 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 soldiers paybook and the airman signs the acquittance note.

Army Book 64

An airman's pay-book contains particulars as to the man's qualification etc also records of payment made and complete and attested particulars as to the rate of pay. Army Form W. acquittance 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 pay master 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 pay master I/C clearing house base with the necessary vouchers

Photography

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

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

The light filters a circular piece of yellow gelatine which is placed in the lens 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 ensure the changing mechanism is working correctly.

Also notice the number on the indicator and see that the full boxes of plates are sealed

Type of Aerial Cameras

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 right-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.

Changing lenses in the air on L type cameras

1/ Close both boxes

2/ Take off bottom box which is full of exposed plate 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

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 130 below the horizontal and shows the ground in perspective

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

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

* Length of one side of are 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

1,0,000	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 reference 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 sheet or small mechanical defect

If it goes not OK and the changing lever will not move use more force. If it does al right 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 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 should be marked the :- B8cd13b14abc

EDITORS NOTE: Pictures – please refer to images of notebook which can be found on website www.stevenwarren.co.uk

Map Reading

Map reading Conventional Signs

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 RF $\frac{1}{20,000}$

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

RF means represented as a fraction RF $\frac{1}{100,000}$ means 1 inch etc on the ground map equals 100,00 inches

100,000 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 similar terms.

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 place between the two contours.

A Gradient is a slope expressed as a fraction. Thus a gradient $\frac{1}{30}$ indicated 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 show 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 **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 square of 1,000 yds. This is merely for convenience 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 sub squares letters 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 A.

Each of these squares is sub-divided into 4 minor square a,b,c,d. a point may thus be described as lying within square B6 & M5 etc. to locate a point in a minor square consider the sides divided

In 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 M5b34 i.e. 3 divisions east and 4 north from the S W 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 coordinates as distinguished from trigonometrical 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 edges) 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 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 ¼ of the area of 1/20,000 sheet and is identified by number 1,2,3,4. Maps of 1/5,000 scale are prepared for special areas for shoots on villages and contact patrol.

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

1/250,000 Long re-con & strategically 1" – 4miles

1/100,000 General work 1" – 1.5 miles

1/40,000 Artillery map & short re-con. 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 the variation is east magnetic is least.

L to true N Variation Course in which flying

195 183 12oE

326 336 10oW

58 47 11oE

220 241 15oW

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

Back bearing of 45 degree = $45 + 180 = 225$ degree

“ “ “ 315 degree = $315 - 180 = 135$

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 arc 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 though still air and ground speed is its speed over the ground

Air speed plus or minus wind speed is the ground speed. Deviation in the horizontal angle between the magnetic and compass meridians varying E or W as the compass is E or W of true N.

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 sea mile or 6080 ft

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 original. 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 degree 04'

It is necessary to consider this inclination only when plotting bearing taken with a magnetic compass. All bearing and directions fixed instrumentally by a survey compass are given with reference to grid or sheet lines.

This may conveniently be referred to as grid north.

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 pint 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 lines is shown on the map place the compass with its centre on the true meridian and turn the map until this lines makes with the needle an angle equally to the variation 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 follow

1. 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 b a straight line. Then turn the map about point marking your position till this line points to the other distant object.
2. 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 lie 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 maps 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.

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

Definitions

Basin. A term used to describe a small area of level ground surrounded or nearly surrounded by hills.

Coll A depression between two adjacent hills or a break in a ridge

Crest. The edge of a top of a hill or mountain the position of which a gentle slope changes into an abrupt one. The top of a bluff or cliff.

Knoll. A low detached hill.

Re-entrant. Valley or depression running into a main feature.

Spur. A projection from the side of a hill or mountain running out from the main feature.

Under feature. A minor feature or an off-shoot of the main feature.

Water-course. The line defining the lowest part of a valley whether occupied by a stream or not.

Water-shed. A ridge of high land separating two drainage basins the summit of land from which water divides or flows in two directions.

Back-angle. The direction or bearing in a traverse of a station which has been passed.

Cross-angle. Is the bearing taken from last station in traverse to some fixed point to ascertain whether traverse closes satisfactorily.

Forward angle. The forward direction or bearing from one station in a traverse to the next in section.

Base or base-line. A carefully chosen and accurately measured line upon which triangulation depends.

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 office.
- 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 the 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 or various units in a garrison and 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.

He will then sign the book in the ration store to that effect.

Next he will inspect the NCO's breakfast in company with the battalion orderly sergeant or corporal.

Procedure

The orderly sergeant or corporal knocks at the door and calls out "Orderly Officer". The orderly men of that room stand up. The Orderly Officer will ask "any complaints?" and will go round 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, tailors shops, book makers 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, etc 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 headquarters 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 the 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 precaution 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 officer's 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 will see 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 Officers orders next day.

Air Force Organisation in France

The Personnel

General Head Quarters – Major General and staff

Brigade – Brigadier General, Brigadier 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 arming wings. An intelligence officer and an artillery liaison in a corps ring 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 liaison 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 seater's and in the reconnaissance squadrons the machines are (two) seater's

Table of Heights

SE 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 controllable 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 purpose 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 around on the aerial drum. At its free end a 2lb 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 ways 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.

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 is the cross-bracing wires of the machine.

The different flights in a squadron work on separate wave lengths. If the transmitter on a machine is set to 180 metres the receiver at the batter must make an adjustment corresponding to the 180 metres. If this is done interference from machines of other flights is obliterated when on 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 batter 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 marking use of various directive effects already mentioned.

Image – please refer to images of notebook on website www.stevenwarren.co.uk

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 gentle release the aerial making use of the hand brake

3/ After calling your batter 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, doesn't jam the other signals and is not easily jammed.

5/ Only authorised code signals should be used. No message 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 Triplane

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 in 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 map up-to-date

Artillery Reconnaissance is the reconnaissance of the enemies' artillery positions.

French Reconnaissance is the re-con 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 given the pin-point of tail and head and if in mass give the pin-point of the centre. Always give the time when spotted.

Artillery

State as near as possible the number of batteries, and give pin-point of each

Bridges. State whether wood stone or iron

Scout machines – Dolphins S.E5 camels A Squadron has 18 machines 6 machines for flight.

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 which has 1 lifting surface

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

Landing wires run downwards and