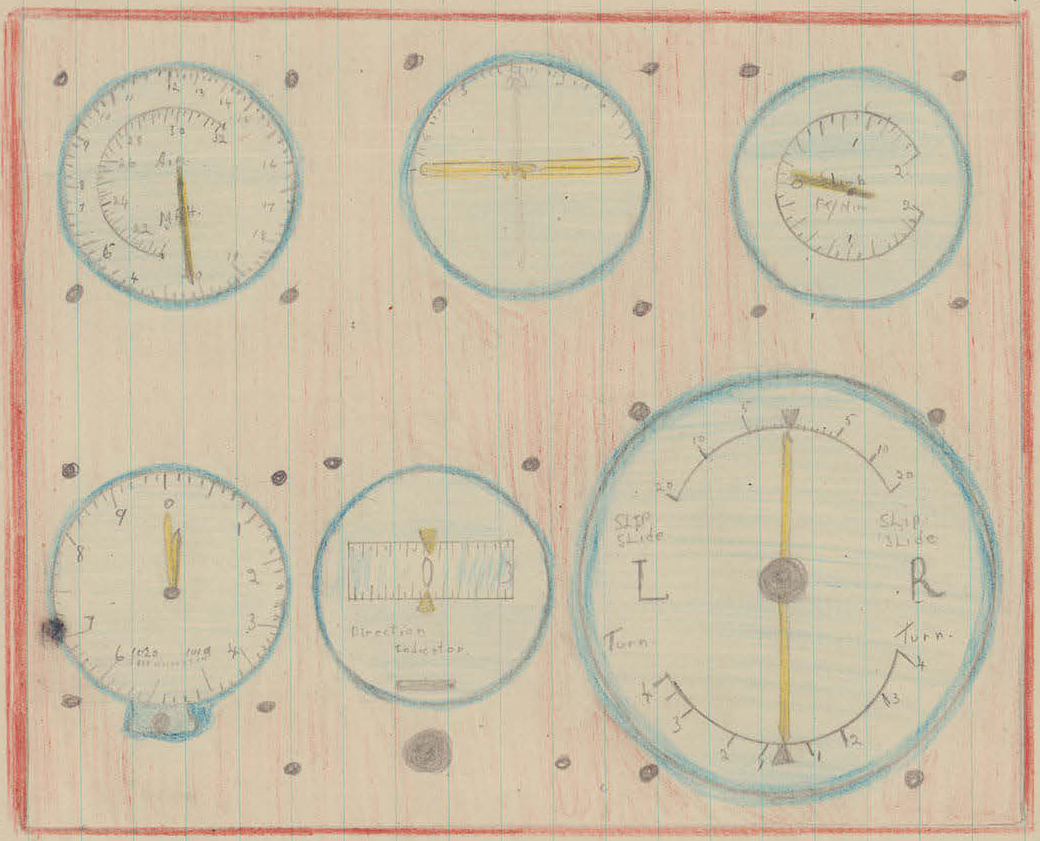
Instrument. Flying Panel MK. I.



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Boost. Gauge.
Red. bezel.
Choke and filter in
union at back.



Rubber mark.

Max boost
level flight.



Copper
tubing.

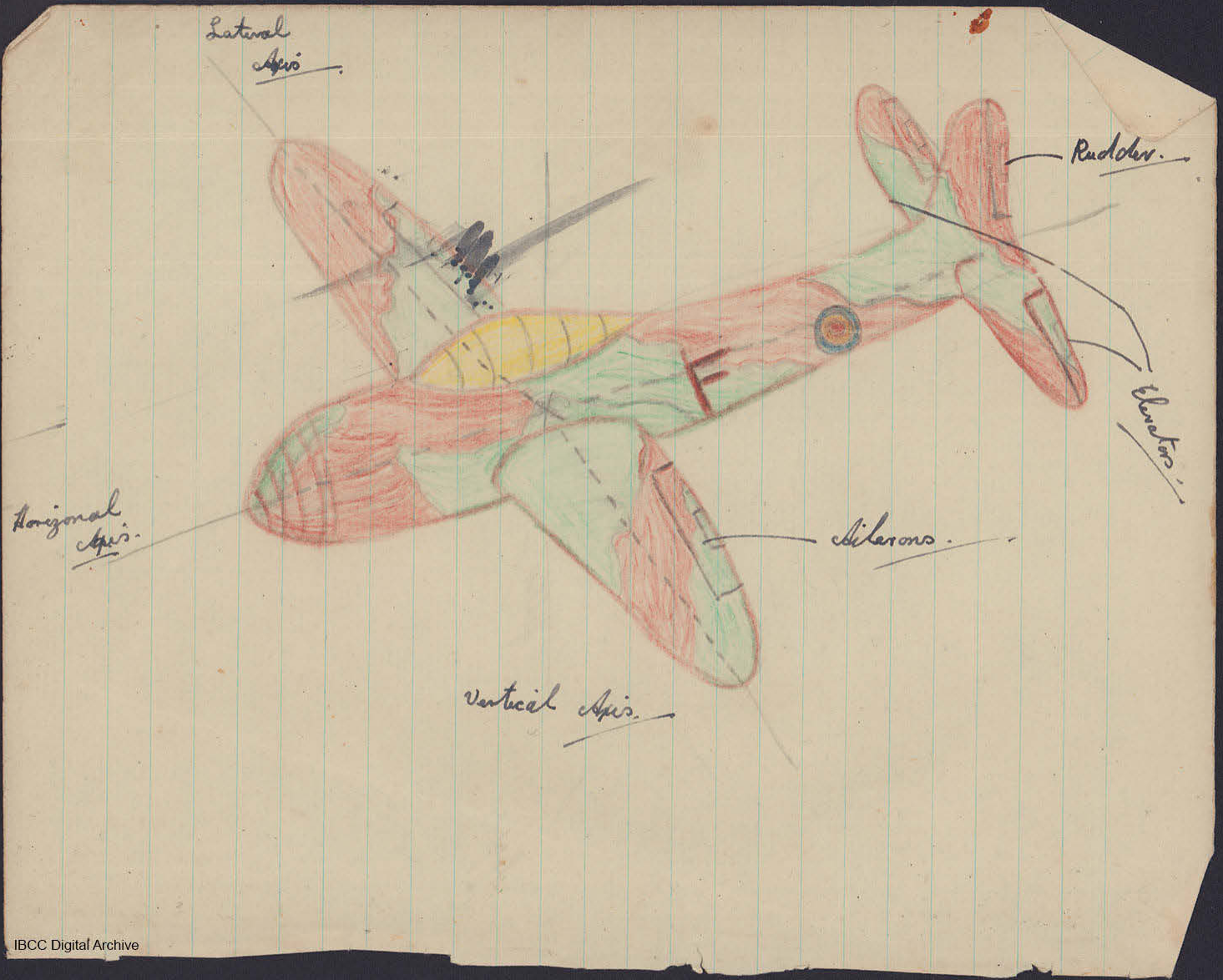


Lowest point
drain trap
brass



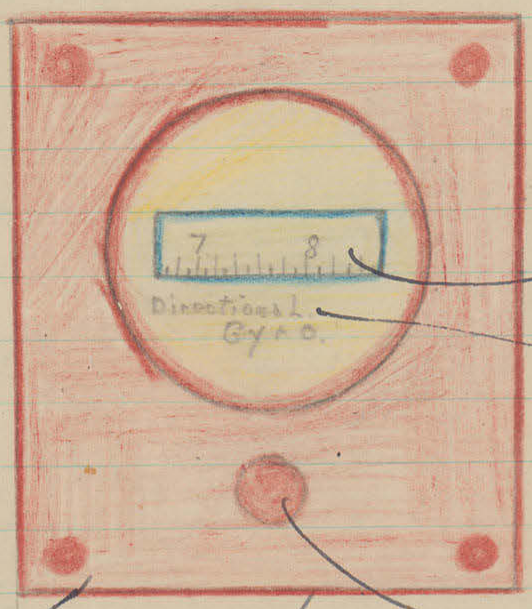
inductor
manifold &
cylinders.

drain plug.



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Ratio Of precession - increased rate of precession, rate of precession, vice
3 increased torque increased rate of precession,



Directional, gyro.

compass. card.

glass.

caging. knob.

filter

case.

MK 3 C* Boat gauge.

Mechism separated from the inlet by means of a diagram it is therefore necessary to have an airtight bezel as no leak can occur, traps are not required.

Directional. Gyro.

Purpose.- To indicate to the pilot the attitude of his A/c in a turn. It is independent of acceleration error and northerly turning errors. It is situated on the B.F.P. and the rotor is driving by means of a pipe from the back of the instrument to the pesgo,

D. I. Check for general security test the caging device for freedom having in a level position check security of filter

First. Minor. Inspection.

Remove filter clean glass in petrol renew tubing pad and replace.

Artificial. Horizon.

To indicate to the pilot the attitude of the A/c diving climbing & banking whilst flying in conditions of poor visibilty,

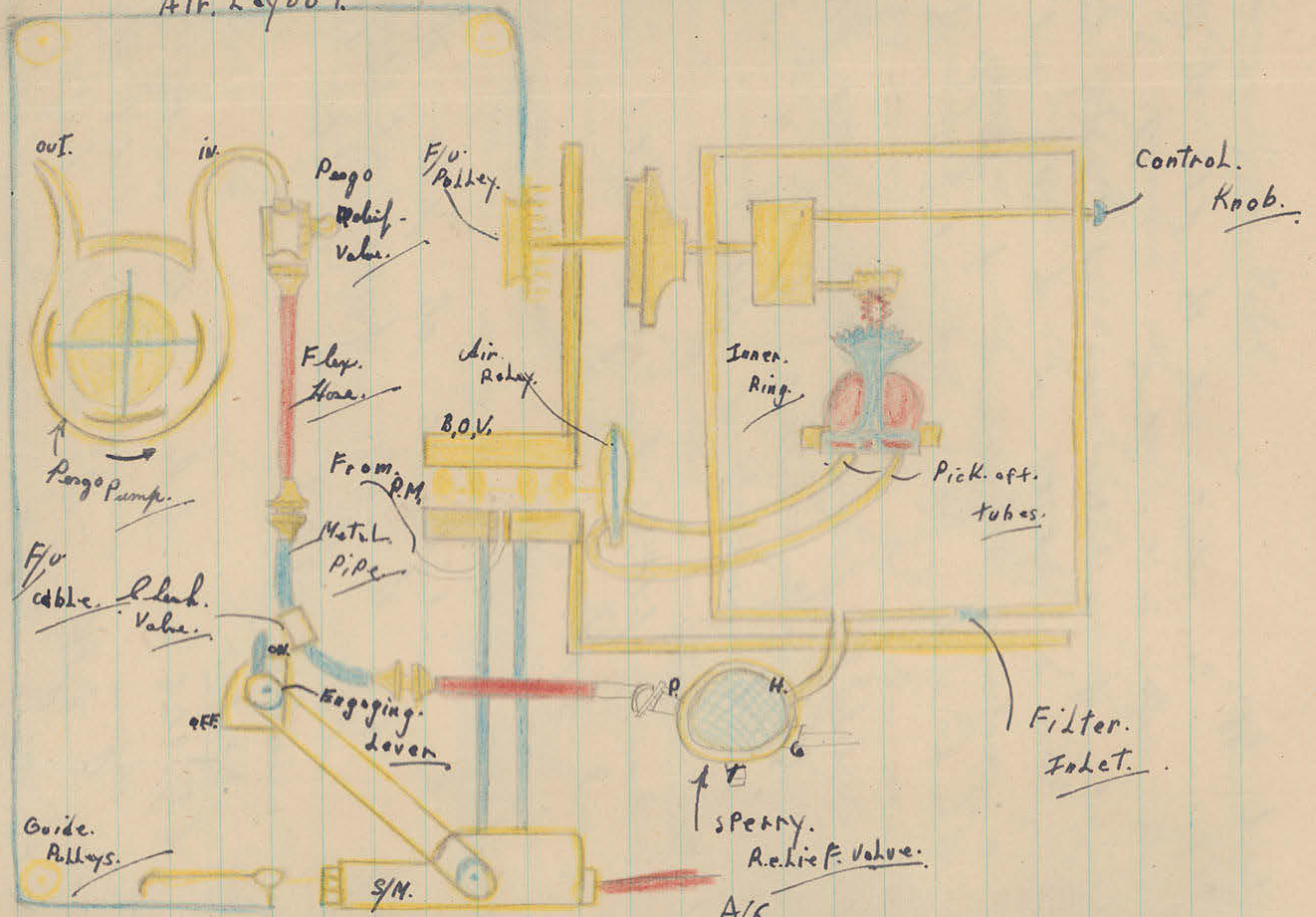
Daily. Inspection

G. V.D.S. - Check the suction and with engines running the model A/c should slightly above the horizon bar

First. Minor. Inspection —

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Air. Layout.



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Remove clean and replace filter and renew felt pad.

When fitting Artificial Horizon.

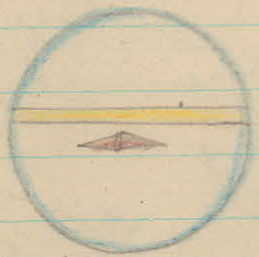
The locking screw must be removed and blanking screw substituted.



Level Flight.



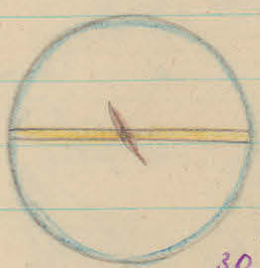
Climbing.



Dive.



30° Left Bank.



30° Right Bank.

Check Valve.

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Sperry Gyro. Pilot

Purpose:—

1. To maintain the a/c on a true course. Level f/ aft and laterally level
2. To increase the accuracy of aibl flight.
3. To release the pilot of strain, and to increase the safty factor when flying in conditions of poor vesiability

The gyro pilot employs a modified version of the direction gyro. or Horizontal Artificial as ontrol units Both units are housed in a mounted unit fitted in front of the pilot where the B.F.R is usually placed. The D.G. unit controls rudder the blanking b limit unit control elevator ailerons.

The Main System.

Purpose:— two pump.

This pump is the means of supply the operating the suction of 3 to 5 in H.G.

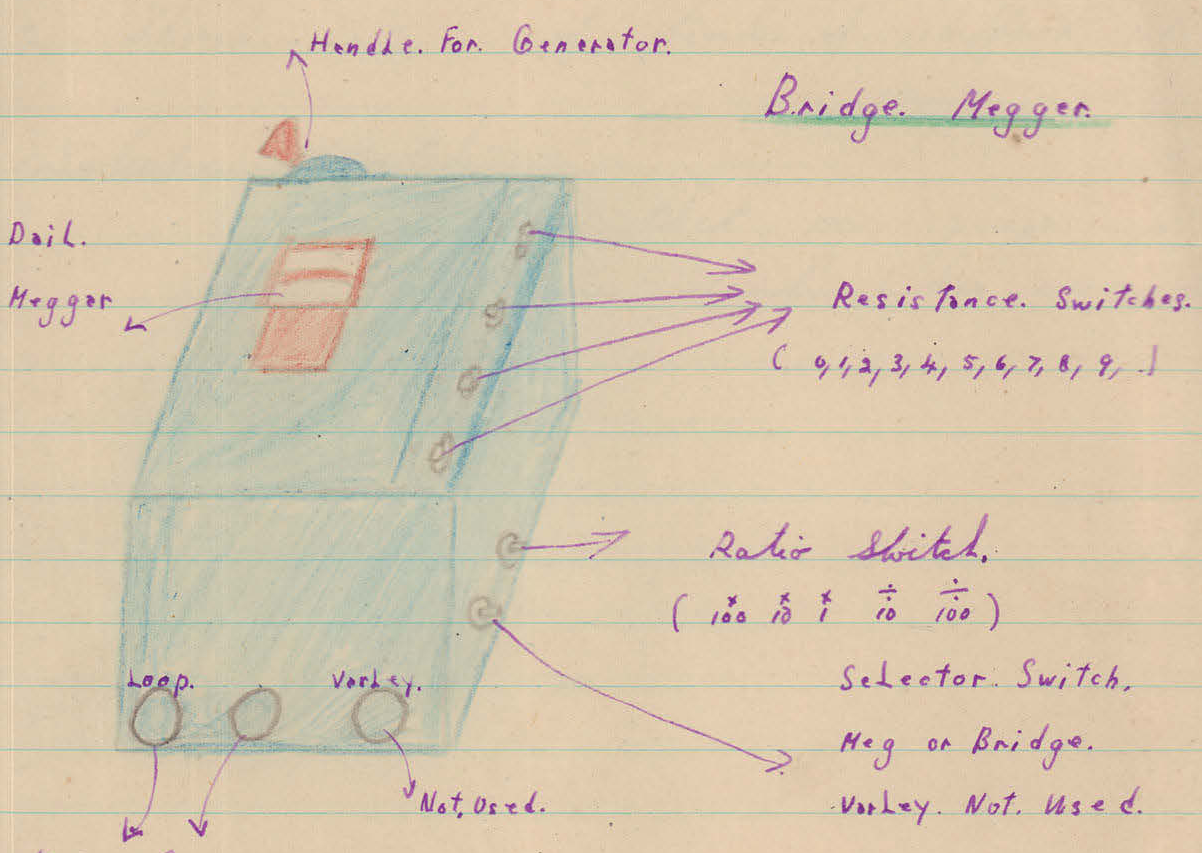
~~This~~ the

Discription.

This pump is directly connected to the engine crank shaft and the inlet unions

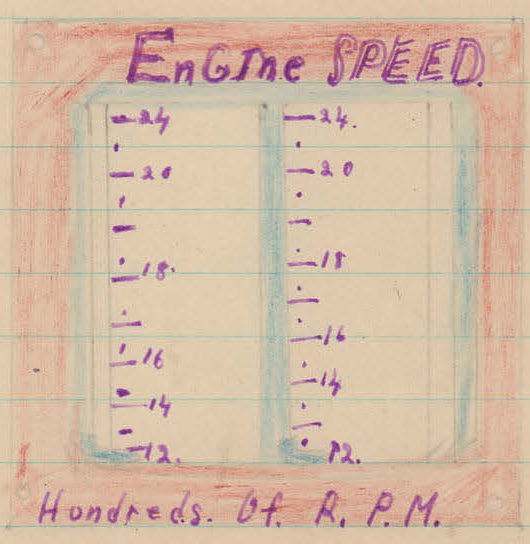
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Bridge. Megger.



Twin. Pointers. MK. II A.

Electrical. Engine. Speed. Indicator.



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Two Scales.

1. Shows contents in the two positions of A/C.
2. Shows " of tanks of different shapes

Selector Switch

Used so that on gauge can serve more that one tank. (See wiring Diagram)

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Installation.

Gauge.

Make sure that the rubber band is round the instrument.

2. Put instrument through hole in panel.
3. Place metal ring round instrument and tighten lug ①
4. Turn gauge in panel so that the pointer is left of zero.
5. Tighten screws in lugs ② against the panel.
6. " lock nuts.
7. Connect cable.

Red to B+.

Blue " B-

Green " P.

Installation (Tank Unit)

1. Fit unit into hole provided making sure cork washer is fitted first.
2. Tighten the 12 nuts (check with wire)

Selector Switch.

1. Fit it in panel in place provided.

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Reflector Gun Site.

Maintenance

1. Clean glass with chamious leather.
2. Check functioning of (~~ground test~~) switch.

A. Day – very light.
B. Night – dim light – and dimmer switch operating.
C. Off – no light.

3. Change unserviceable bulbs.

Warning.

Make sure the bulb is inserted properly black line on bulb with white line on socket.

Simonds Fuel Content Gauge.

This is of a still tube type and its object is to allow a reading to be taken when the A/c in not in a laterly level position it consists of four parts.:-

Tank unit.
Indicator
Switch and limiting resistance

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The tank unit is a rectangular tube of duralumin which capped with alloy castings, the castings carries a small plate which gives the information as which tank it belongs to and which ~~(the way (tank it belongs to))~~ direction in which it is to be fitted,

The indicator is a cylindrical in shape and has two scales and one pointer. and the range is only 90°

There is an terminal block at the back. carrying three terminals MK. I.C.2.

The Switch.

Is a small black bakelight case with a white push button which is engraved (Press).

The Limiting Resistance.

Is used to limit the current in the circuit and consists of a fibre base. plate carrying a small resistance which are protected in a black bakelight cover.

Installation.

The tank unit should be fitted firmly vertical in the correct tank when the

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a/c is in a flying position and the red arro
the small plate should be pointing forward,
the flange of the tank unit should be fitted
a cork washer which has been covered with bostick
the indicator and Switch will be fitted in the
fuel gauge panel and are flushed mountains
(Installed from the back of panel)

D.I.

Press switch and see that the gauge indicates
the amount of fuel in in the tanks, (check with
Litter or form 700) b.g. V, O S,.

30 hr + 30 hr. Includes D.I, plus general check on wiring
fuses terminals etc.

Electrical Speed Indicator.

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system has been designed to cut down maintenance to a minimum and among it advantages are the following:—

1. Being A.C. the compass is on effected.
2. The indicator is very accurate.
3. There is no commutor or brushes to clean.
4. It is very sensative

Set consists of two parts the generator & indicator connected together by a length of 3 core cable.

The generator is revolved by a flex drive and in appearance is simular to the MK.II. generator except that we have three terminals and thimble connections where as the MK.II. has two pin plugs and sockets. the terminals are N°1, 2, 3, and the terminal cover has MK, on it at the back a small connection chart.

The Indicator.

Has simular connections at the back and the dial is circular and is marked of 1 to 10 and has two points the are operated through gearing the hands of the clock. The terminals on the indicator are numbered 1, 2, 3, and are coloured. red, blue, green, in that order for a clockwise direction rotating engine

N°1. On the generator is connected to red on the indicator

2. Wire up according to diagram.

Daily Inspection -

1. C.C.C.V.D.S.
2. Check functioning by pushing switch.
3. " that pointer is left a zero.

30+ hr.

Check calibration ~~common faults~~.

Common. Faults.

1. No reading when button is pushed.
   Accumulator disconnected
   " run down.
   Fuse blown.
   Leads broken (use continuity tester)
   Short circuit (" " Use. Meggar)
2. Fuse blows. when button is pushed.
   Test for perished insulation (use meggers)
   ~~between tank full and vertical~~
3. (~~Red lead broken~~,) Pointers moves to o position between tank full and vertical.
   Red lead broken.

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4. Pointer moves to a position between tank empty and ~~feed~~ vertical.
   Blue lead broken.
5. Pointer moves to vertical position.
   Green lead broken.

Note:-

In the last three faults:-

1. If the fault occurs in all position of the selector switch then the break is in the lead to the gauge.
2. If the fault is only in one tank position then the break is in the lead to the tank.

Engine Cylinder Thermometer.

Measures the temperature of the cylinders.

Three parts:-

1. The hot junction plus aberto covered lead.
2. Compensating leads.
3. Indicator.

Hot junctions ~~to~~ connected to cylinder head.

(1·75 ohms resistance.

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Compensating Leads.

A. Leads (1 only) each lead = 1.75 ohms.
10, 20, 30, 40, 50, 60, 70, 80, 90, 100 ft.

B. Leads (2 must be used) each lead = .875 ohms.
10, 20, 30, 40, 50 ft.

C. Leads (3 must be used) each lead = 5.83 ohms.
10, 20, 30 ft.

" must not be cut or altered,

Installation of Indicator.

Secure it in the panel (join up bonding wire)
2. Remove damping wire, and leave an open circuit
3. After half an hr, compare with marks thereon,
4. Adjust pointer by screw in front of indicator
5. Connect compensating lead.

Maintenance.

P.I. C.G.V. D.S. Instrument should read temperature of coldfit if engine has not been run up. recently check security of leads.

30 Hr.

Check functioning during a ground test of engines.

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Electrically Heated Pressure Head.

D.I. Switch on. Feel the head to see whether it is heating, if not,

A. Check ~~accum~~ accumulator connections.
B. " " charge.
C " fuse.
D " leads for continuity (i.e. connections etc.)
E " " " start circuit.

If none of these, pressure head is u/s.

When pressure head is dry and cold any reading less than 3 megohms is unsatisfactory.

2. If pressure head is sodden, switch on, dry then test when cool.

Flap Indicator.

Similar in operation to fuel content gauge.

Note.

1 It is continuous in operation.
2. " reads degrees.
3. It tells the pilot the position of the flaps.

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to the blue and 3 to the green.
For an anti-clockwise engine blue and green are reversed.

Installation.

The generator is fitted on a little bracket near the auxiliary gear box and there is usually a small sponge pad between the base of the generator and bracket.

The Indicator.

Is a flush ~~mounting~~ fitting on the instrument

D.I.

On a engine run up see that the pointer moves smoothly. C.G.V.D.S.

30 hr. + 30° hr.

Same as DI only plus check on the wiring

Design. System.

The design of this system has been arranged, so that the different functions of the A/C can be measured in the same way

These functions include.
Fuel contents, Oil contents
Flap, Position, Steering Indicator + Directional Gyro.
The advantages of such a system include,
accuracy, lightness, space saving, easy maintenance,
easy installation and interchangeability.
The principle involved is that of the rotating
converter, There are two main parts the
transmitter and indicator.
Example.
Electrical Fuel Content Gauge. IV.
The transmitter.
Is similar to a MK II, in that it
has a bakelite cork ~~cork~~ float and gearing
The main difference between the two is that
the MK. IV. has three pin plugs and sockets
and the MK II. has five terminals MK. 1, 23, +6, -7,

The indicator
Is a small cylindrical bakelite case with
a square front. The pointer in the off position
is always vertical and is known as the full off.
position, The range of the pointer is
85. approx 300° at the back of the case.

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D.I.

Switch on dynamotor and see that it works.
Check all visual indications,
Oil pressure - zero.
" temperature - days temperature.
fuel pressure - zero
Air intake temperature - days temperature.
Nose, port, Stbd, wheels down, flaps up.
Boost gauge will read the pressure of the day.
in ins of mercury or in millibars ÷100,
Fuel contents amount of fuel in tanks.
Check P. V. D. S. and switch off.

30 hr. and 30* hr.

See local V. M. O.s

Avometer or Test meter type D.

Setting the avometer to measure volts and amps D.C.

1. Set the A.C. switch to D.C.
2. " " D.C. " " the required ranges.
(This may include the setting of the multiplier knob)
3. Connect the positive terminal to the positive of the supply and the negative to the negative and read off the scale.

Note

When measuring volts the instrument must be in parallel and when measuring amps, must be in series.

To Measure Resistances.

1 Set the A.C. switch to D.C.
2. " " D.C. " to 10,000 ohms.
3 " " multiplier knob. to K.=2
4 Connect the positive and negative leads together.
5. Set pointer to zero by means of P switch.
6. Reset the D.C. switch to 1,000 ohms. and adjust the pointer to zero by means of A. switch.
7. Reset the D.C. switch to 10,000 and check zero position.
8. Disconnect the 2 leads and carry out test.

Autosyn System.

This is purely a transmitting system which functions on similar lines to telegon equipment, but has the further advantage of reducing maintenance and weight. There are two main parts the indicator and transmitter.

The transmitters

Are fitted at the particular

Telegom. Tests.

Testing table for 4 dail instruments -

Dail & Place. N°	Set switch 1 to	Set switch 2 to	Resistance in ohms.
Primary Dail 1. Place 1.	A.	1.	200 - 240.
Dail 1 place. 2.	A.	2.	900 - 1100.
Dail 1. " 1 and 2.	A	3.	900 - 1100
" 2 " 1.	B.	3.	1800 - 2200.
" 2 " 2.	A	4	900 - 1100.
" " " 1 and 2.	A	5	900 - 1100.
" 3 " "	C.	5	1800 - 2200
" " " 2.	A	6	900 - 1100.
" " " 1 and 2.	A	7.	900 - 1100
" 4 " 1	D.	7.	1800 - 2200.
" " " 2.	A	8	900 - 1100.
" " " 1 and.	A	9.	900 - 1100
	E	9.	1800 - 2200.

Testing table for single Indicators and all transmitters

Place N°	Set switches 1 to	Set switches 2 to	Resistance in ohms.
Primary.	F	10	800. - 950.
Place. 1	G.	11	900 - 1100
" 2.	G.	12.	900 - 1100.
" 1 and 2.	H.	12.	1800 - 2200.

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position, from which they are to measure.

The engine indicators are fitted on anti-vibrational mountings fixed in the engine, so that only short lengths of tubing and capillary are required.

The pressure temperature or mechanical movement of the various systems operates a small autosyn motor which delivers an output of 26 - 52 volts, at 400-800 cycles per sec. This output is collated by an similar motor which moves to line up with the transmitter motor, and in doing so moves a pointer over the scale, calibrated in lbs per sq. inch, degrees centigrade or degrees rotation.

Recognition

All the transmitters have one meter and are recognised by the case which has a crackled black finish. It also bears a small plate is which is inscribed "A/c. U.S. Army. transmitter" = e.g. Fuel pressure. They will carry two unions

1 A tube (aerograf) or a capillary or a flex drive to other unions.

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2. Is an electrical plug and socket having four pins marked H.B, C, D,

Indicators (Single)

These are encased with a cover having a crinkled black finish, They have 4 pin plugs and sockets at the rear and carry one pointer and are usualy only found in use as flap or bomb door. indicators

Dual Indicators.

Carry two meters and are therefore longer, they have 7 pin plugs and sockets at the rear M.K, H, B, C, D, E, F, G,

The casing has a crinkled black finish and the dial has two pointers moving over it the pointers are M.K. 1+2. or 1+2. or 3+4 to indicate Port, Stbd engines, The Lcb system is energised by dynamotor or an engine driven alternator,

Maintenance
D.I.
30 + 30* lb.

A. for:
telegrams

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Breeze. Wire.

The prime reason for this type of wire is that the larger a/c can be made in sections already wired. When the sections are connected together by an system of multiple plugs & sockets the a/c is fully wired throughout. It consists of lengths of cable in a metal sheath and the ends are connected to the plugs & sockets. Each plug and socket is numbered so that there can be no confusion when connecting up.

Further advantages include.

1. Complete screening against radio interference
2. Complete bonding.
3. The wires have mechanical support.
4. They are easy maintained and tested.
5. In a/c operating near the sea, the wiring is absolutely ~~watertight~~ waterproof.

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Oxygen.

Uses.

Oxygen is used in a/c to supply the members of the crew with sufficient ~~to~~ to maintain their normal activities. Without oxygen the nervous system becomes affected, muscular reactions are slow and at times there is complete loss of vision. This state is known as "Black out"

Oxygen is used under the following conditions

1. When the duration of flight at 10,000 ft exceeds 1 hour.
2. All flights above 15,000 ft.
3. When it is cold.
4. When the rate of climb exceeds 2,000 ft per min.

Oxygen is stored in vibrak steel cylinders of seamless construction, fully tested 750 lbs 1,800 lbs per sq ins. They are two types that are used in normal systems and those used in emergency. The Normal Bottle has painted on it, "After removal from a/c remains not to be discharged."

Around the neck of the cylinders is a brass collar on which is stamped the M.K. a

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and the date of issue into the service.

Screwed into the neck is a cylinder valve. (MK VII) which must be fully open or fully closed. The handle of the valve is MK. "use. one. oil or grease."

The only difference between normal and insitu cylinders is that the insitu cylinders has a double layer of steel wire, to prevent fragmentation, and the cylinde valve is replaced by a 3 way connecting piece.

When Cylinders Should Be Returned To Stores.

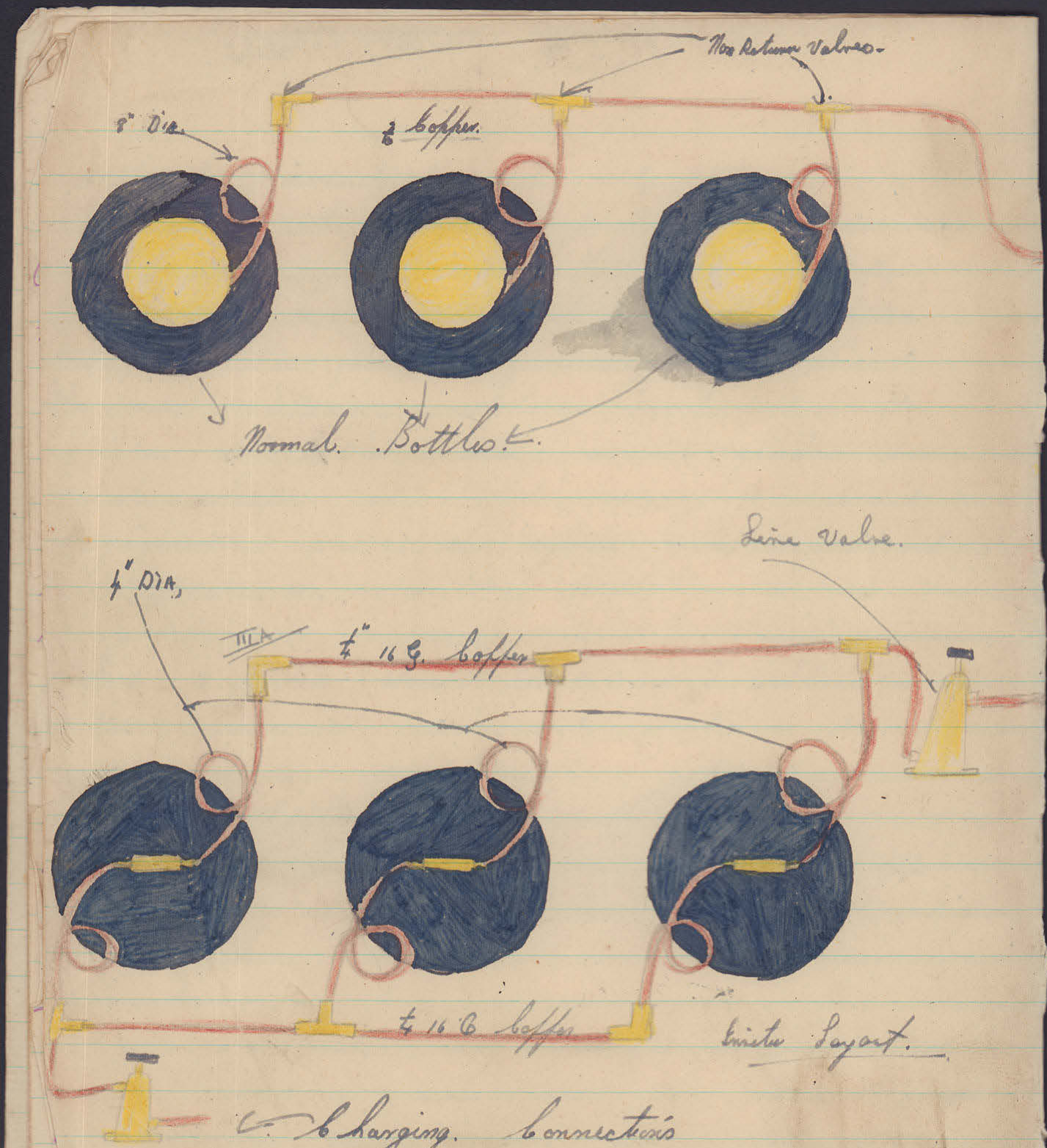
Two years after the date stamped on the collar.

When cylinders are accidently empty.
" all the paint has been scrapped off.
" the oxygen has a bad smell.

Connections

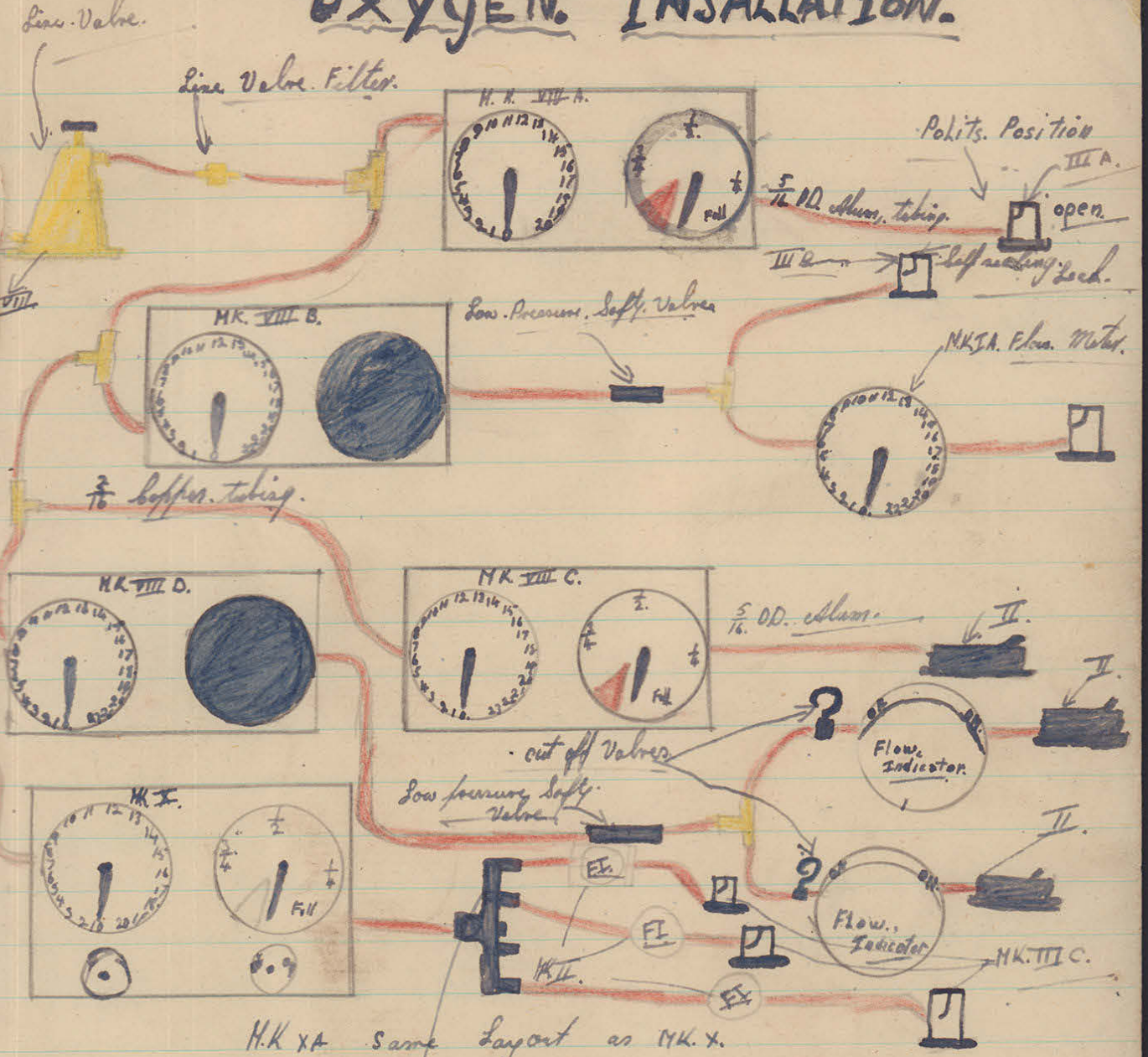
Cylinders are arranged in batches and connected into a main pipe line by 3/16" 16 gauge. high pressure copper tubing, with nipple connections. These lengths of tubing are arranged in loop of 8" in diameter to allow

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OXYGEN. INSALLATION.



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1. Black steel casing
2. Squared shaft 1" at engine end ½" at generator end.
3. Split washer at start end only.
4. Casing cover small at same end to permit shaft to ~~permit~~ pass through.
5. Engine end has grease hole.

Installation.

1. Make sure electrical connections are correct
2. If not remove the screw in the plug. and reserve the pins.
3. Generator bolted on or near the engine
4. Indicator is supported in the panel by a bracket
5. Flexible drive must be coated with no sharp bends.
6. Gear box should be greased with high melting point grease.
7. Grease drive with anti-fraging grease.

Maintenance.

D.I. — C.C. C.V.D.S. — check functioning when engines are run up.

* hr. —

Remove and clean brushes, clean commutator if necessary

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check the calibration.

Flasto.

1. No. Reading — Plug reversed, broken leads, short circuit
2. Flickering pointer — Faulty flexible drive.
   " breaks.
   " commutor.
   Broken coil in armature.
   Bad connection.
3. Under. Reading — Oil or grease in commutor

Fuel Contents Gauge.

Tank Unit.

Position of the float depends upon the amount of petrol, Three wires (tri-cel) cable, red, blue, green. wire to connect arm.

Gauge.

Reads only when button is pushed (to prevent risk of fire). Three connections.

B+ Red. lead.
'- Blue "
P. Green "

Pointer is to the left of zero when no reading is being taken.

static) tube to prevent ~~(to fro)~~ the ingress of dirt and moisture. Later types of pressure head have the pressure and static tubes concentrically arranged, and electrically heated. The electrical element should never be left switched on for more than 5 mins, when the A/c is on the ground.

Installation.

The A.S.I is installed in the instrument panel and connected to the pressure head by $\frac{5}{16}$" O.D. alum, tubing and MK I low pressure unions. The joints should be as few as possible, and the pipe line should have no loops which may collect water, Pipe lines being installed should be slated at each connection made. A/c with with folding are fitted with MK I. flexible connection near the hinge. A.P. 1275- Vol I. Sect. I. Chap. III Sec. 19.

In cases where a continious fall in the pipe-line from the instruments to the pressure head cannot be obtained, a drain trap must be fitted in the lowest part of the pipe line.

The trap consists of a 4" length of $\frac{3}{16}$" O.D. copper tubing into each pipe line by means of a low-pressure "T" union.

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Maintenance

D.I. Ensure that the glass is clean and the instrument is secure. Where an electrical heater is fitted, it function correctly.

30. hr. inspection - Check the pressure head for security, ensuring that the trap and static holes are clear and free from burrs.

Drain A.S.I drain traps.

30* hr D.I. Test both pressure and static pipe-lines for leaks.

Turning. Indicator.

This instrument is fitted in the B.F.P. and gives the pilot two indications

1. The rate at which the A/c is turning
2. Wether the A/c is correctly banked or not

The dail consists of two halves, the lower half has a scale MK 1. 2, 3. 4. on both side of a centre zero, moving over this scale is a pointer which is controled by a gyroscope the A/C turnes this gyroscope is displaced and moves to indicate by the pointer the direct in which the A/c ~~(illegible)~~ is turning and at what rate, The figure 1, represents 180° pr min fig. 2. 360° pr min. fig. 3. 660° pr min, fig 4 1080 pr min

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the top pointer is controlled by a pendulous weight and moves over a scale of degrees, again 14K, on. both sides of centre zero. The pendulous weight is affected by gravity and centrifugal force.

In a correct bank these two forces are equal and the pointer remains on zero, if the A/c is not correctly banked the pointer indicates by how much and which direction the A/c is out sideslipping. The instrument carries a connection for connecting to the suction pipe, the air drawn from the case causes the air in the A/c to enter the case via filter and. jet the air impinges on the rotor buckets and the rotor is turned at speed.

The instrument must be installed with both pointers at zero when the A/c is laterally level.

D.I. by V.D.S. and see that T/C pointer indicates the correct position of the A/c and the bottom pointer reads zero.

30 hr. - Clean filter and check calibrating

N.B. Filters are removed in the case of the MK.I. by unscrewing a small cap. over the air inlet and in the case of the MK.II. by removing the back pl

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a peg spanner.

A.S.I. Leak Tester. – The static connection applie a suction till the instrument reads 180 mls pr hr. scale of. and the pointer should not drop more than 15 mls pr hr in 10 seconds.

Applie a pressure to read 150 mls pr hr scale of and there should be no leak.

Disconnection the pipe line from the pressure head and "T" in a standard A.S.I. applie a pressure till the instrument reads 150 and time taken to drop to 135 mph. should not be less than $\frac{1}{2} \times \frac{L}{16} \cdot (N + \frac{L}{16})$ seconds where N equals the No of instruments and L. equals length of tubing, Applie a suction to the instrument reads 150 mph and the pointer should not drop below 135 in less than $\frac{5}{8}$ seconds

The MK.I. Barometer. (Portable.)

This instrument measures by a column of mercury atmospheric pressure and is used when calibrating and checking air-craft instruments when being used certain condition must be taking into account i.e. gravity temperture and isothemal or I.C.A.N. laws. to read it move the cursor until the two knife edges and the meniscus of the mercury are in line and read off on the contracted inch scale the position of the datum MK on the front of the cursor
It should be installated on a flat steady base out of drafts and the direct rays of the sun.

MK XIII.

The mechanism is enclosed in a black bak. light case with a nipple at rear for connection into the static pipe line so that the instrument will read the baran pressure in turns of ligh the dail has two calibration circles and one pointer, the dail is moved by a small knob at the bottom right hand side of the case there is a hole in the dail which carries two datem MKs. and there is a third on

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second dail beneath the top dail.

When the pressure is standard the two datum marks when set against the third should bring the zero beneath the pointer if the day is not standard when the datum are set the pointer will read the amount above or below standard in feet.

Leak Test.

Before fitting in crew position apply a leak test.

MK. IV. Altimeter

It is fitted in a long bak-light case the mechanism is fitted inside it the case carries a nipple at the rear for connection into the static pipe line, the dail is marked "1. to 10." and there are three pointers a large one measures in thundreds a smaller one measuring in thousands and even smaller one measured in 10, of thousands The dail carries a small window thought which can be seen a milibar scale, the bottom of the case carries a small knob and when this is

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turned the pointers and the milibar scale both moves. when the air-craft only the pointers move. Ths scale has been provided for three reasons. (~~when the~~)

1/ When the scale is set to the days pressure. the pointers should be at zero.

2/ If the pointers are set to read the high of the (~~high of the~~) aerodrome above sea level. the milibar scale will read the barometric pressure at sea level at that time

3/ If the pilot is forced to land at some aerodrome other than his own he can set the new barometric pressure and when he lands the pointers will be at zero.

Leak Det. MK XIV.

With a piece of rubber tubing, apply the suction until the pointer reads 1,000 ft. real of. and the pointer must not drop below 900 ft, in less than one minute.

D.I MK XIV.

C. G. V. D. S. set the P_1 P_2 of day, and the pointers are allowed to indicate between +50 -80. then neglecting the slight change return the pointers to zero. Portal Comand and

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Fighter command usualy set there pointers to zero and bomber command set the light of aerodrome above sea level.

The Rate of Climb Indicator.

The principal of this instrument is that of of a pumptured type i.e. if blown up it will remains expanded and if no pressure is applied will remain deflated it has three function.

1. Used in conjunction with A.S.I. will help the polit to prevent the A/C. from getting into the "stalling angle." (✱)
2. Gives an indicating of level flight.
3. Used with the altimeter A.S.I. and barange bare will help the polit to land an A/c under conditions of darkins or poor visiablety

To installed top right in the B.F.P. by two. to B.A. nuts and bolts there is a nipple at the rear which is connects to the static side of the pressure head or in modrate form of A/c to the static vent at the bottom right hand side of the indicator is a small screw head which when turned moves the pointer and provides an zero adjustment.

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Leak Test.

Using a ¼ tube of water and a T, piece apply a pressure equal to 11¼" of water, seal off and the level must not drop more than one inch in less than ten seconds.

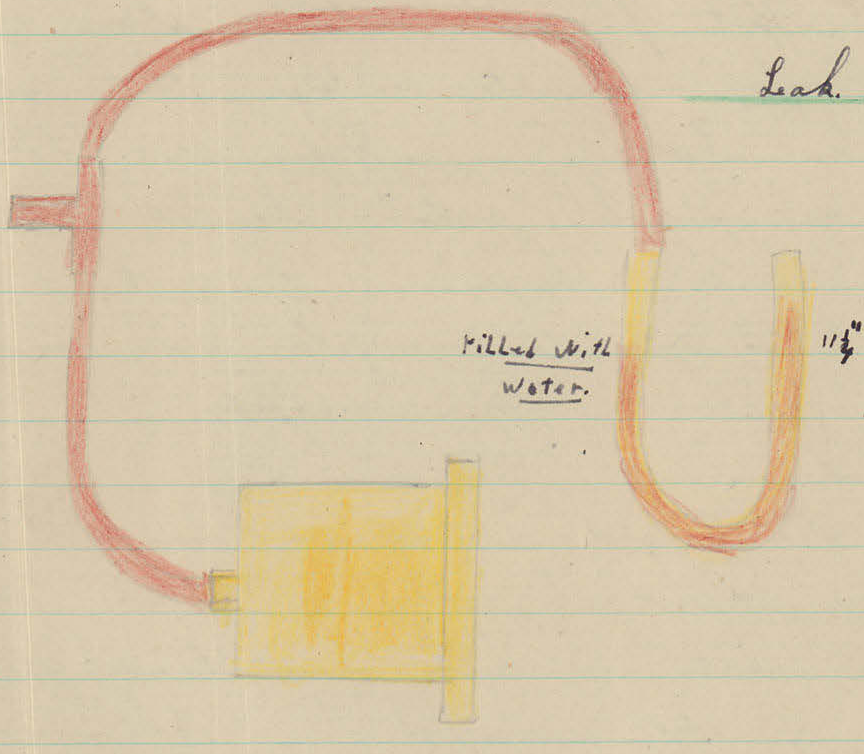
Daily Inspection.

Check V. B + S. and set pointer to zero.

30 hr. 30* hr.

Same as D.I. only a plus check calibrating

Leak Tester.



Air Speed Indicator.

This instrument indicates the speed of the A/C relative to the air, but not rel... the ground. It is a differential ...

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gauge and measures the difference in pressure between still and moving air. The dail is calibrated in miles pr. hr & knots. Two nipples at the rear of the moulded case are marked P. and S. These two nipples are connected by means of ¼ in O.D. alum. tubing and low pressure unions to these respective tubes on the pressure head.

On flying boats, etc, the tubing is of copper and the low pressure unions are of brass owing to the corrosive effect of salt water on alum.

It is essential for accurate readings that all unions should be tight. When A/c has folded wings, a flexible metal-braided tubing is fitted near the hinge. The instruments are fitted in the pilot's navigator's and bomb-aimers cockpits.

The pressure Head.-

Consists of a static and a pressure tube mounted parallel & as close to each other. It is fitted on the A/c out of the slipstream of the air screw and pointed forward. The pressure is open at the front, and while the static is closed and pierced radially with small holes, at right angles to the airflow.

A trap is fitted to the pressure and

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Boost System.

It will indicate to the pilot the pressure in which the induction system of a super charged aero 1. engine relative to an normal atmospheric pressure at sea level. Suffle connection soldered on. Set pointer to pressure of day and rubber line to maximum

Choke fitted in union at back. very tiny hole. Should read barometric pressure of day. Filter fitted in hole. behind the choke centre one to boost gauge, and the other one to indicate system. Leak test.

If the gauge goes up to 4 lbs. apply a pressure 4 lb pr sq. ins" and the pointer should not come back till the tap in in one min.

The Gyroscope.

Spaced Gyroscope.

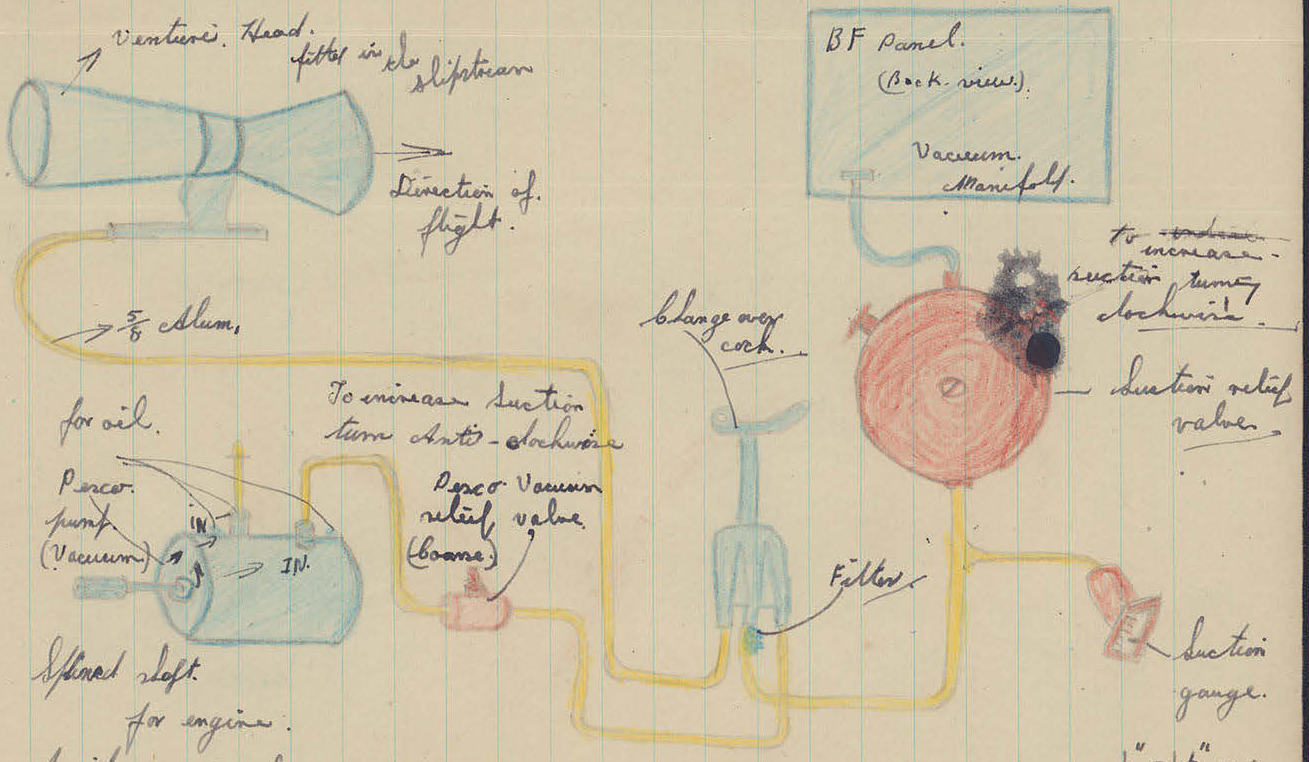
A perfectly balanced gyro which will maintain it position in space.

Earth Gyroscope.

A specially unbalanced gyroscope which maintain itself so that there is no relative between the gyro and the earth

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Suction System.



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are interchangable according to the direction of rotation of the engine. Flexible hose should be used in connecting the unions to the rest of system.

Pesgo relief Valve.

It is fitted close to the pesgo pump and is the means of adjusting the suction. To increase the suction the adjusting screw should be turned in anti-clockwise direction. A filter is fitted to prevent dust entering the system.

D.I. —

Check for general security

First Minor Inspection —

Remove clean and replace filter

Spray Suction Relief Valve.

It is fitted on the mounting unit and enables a fine adjustment to be obtained for the suction in the system. To increase the suction remove the cap and turn the adjusting screw clockwise tighten the lock nut and replace cap.

D.I. & F.M.I. as Pesgo pump.

MKIV. chute. Controls.

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Check Valve.

This is fitted in the suction pipe line to protect the gyro unit against a back pressure of oily air should the Pesco pump reverse it direction of rotation The arrow on the casing should all ways point towards the Pesco pump.

The Air Relay Valve.

To transmit the control from the gyro to the balanced oil valve

Description

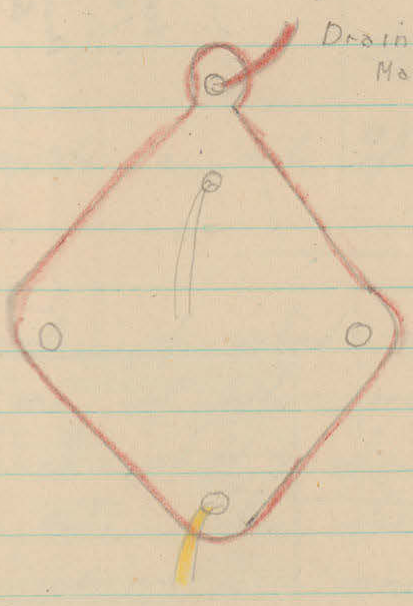
It consists of two cloid castings bolted together, having a reindeer skin dia, between them, The dia, is strengthened by two metal discs having a spindle attached to the centre which connects to the balanced Oil valve, Air is drawn in through a filter at each side then passes to the pick off in the unit, Normaly the small slots are half covered and the pressure in either side of the A.R.V. equals, If the A/c is disturbed the movement of the pick off over the knife edge causes

the pressure to be unbalanced in the air relay. The disc is deflected therefore causing a movement of the D.A.V. piston allowing air to pass to one side of the servo motor thus applying a/c controls to bring the a/c back to its normal flying position.

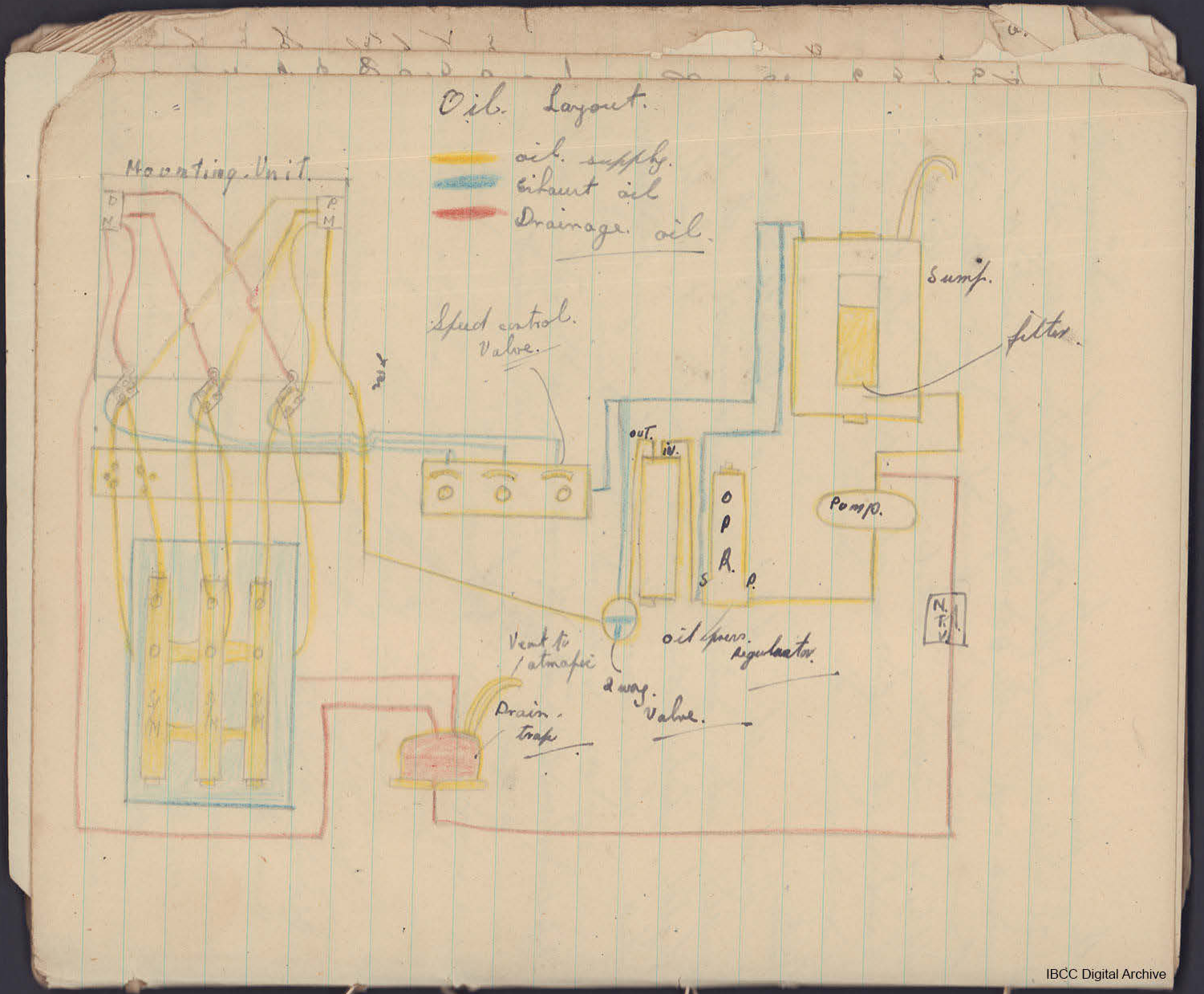
Test.

Hold the A.R.V. in a horizontal position with the spindle upwards with the thumb lightly pressed to spindle up. it should fall back smoothly to its original position.

Repeat this test with the spindle in a downwards position.



MK II. elect. controls.



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Sump. (oil system)

To supply the system with oil it also collects drainage oil from the system

Description:-

It is an oval container having an number of unions a filler plug, a drain plug, and an inspection window. It must be fitted below the level of the mounting unit in order to provide gravity drainage it should be maintained $\frac{3}{4}$ full on a D.T.

In some a/c a sump is fitted which supplies oil for the operation of the hydraulic system therefore the servo system maybe connected to the same sump.

Oil Pump.

To provide a rate of flow of oil through the system

Description.

It consists of an oval casing casing and two gear wheels one of the gear wheels being driven of the crank shaft of the engine. The pump can only be fitted to the type of engine it is made to suit.

Care must be taken therefore to ensure

MK II. adjt. controls.

that the rotating of the pump coincides with the direction of rotating of the engine to this effect there is an arrow on the back of the casing. The inlet is clearly labeled I.N.L.E.T. and the pipe line from the sump must be connected at that point

Oil Pressure Relugar.

To regulate the pressure of the system 1/2 + - 10 lbs. of the pressure layed down for that particular type of a/c, To increase the pressure the screw should be turned in a clockwise direction

D.I. check V.D.S.

F.M.I. Same as D.I only check 2 way cock.

Purpose — This is fitted between the oil filter and mounting unit and provides a means of by passing the oil back to the sump when carrying out any repair or inspection on the mounting unit side of the system. It also enables the pilot to pass the oil back to the sump should leakage occur during flight.

Oil. Layout.

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Mounting Unit.

This consists of a frame supported by 4 load AVM's in the cockpit in position where the B.F.P. is usually situated. The two units which into this frame and are held by two bolts attached to the mounting unit are the three air relay valves 3 B.D.V.S. electrical connections main suction drain and pressure manifold and on end the spray suction relief valve is fitted

All connection to the mounting unit are of flexible hose.

Testing Over Ride valve.

A. Connect to direct air pressure gauges to the 2 working manifold block.

B. Start up A/C engine and put engaging lever on

C. Apply manual control till one gauge reads 25 lbs pr sq in above normal working pressure the valve then connected should then blow off

~~Testing for air in servo motor~~

1. The engines must be off and engaging lever o

1 Reject moving control in opposite direction adjust by grub screw if necessary.

Testing For Air In The Servo Motor.

1. The engines must be off.

on engaging lever on apply manuals pressure

MK III. Auto. Controls

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Daily Inspection on Gyro.

1. Check oil level it should be 3/4 full.
2. " for air in the servo motor.
3. " the vacuum. it should be 3 ins Hg at a thousand revs, and 5 ins at full maximum r
4. " the oil pressure it should be within plus or minus 10 lbs. in pressure.
5. On cage climbing unit and if A/c is not level the gyro should slowly move towards an indicating of the A/c attitude
6. Set and uncage D.G. but compass card for freedom and leave caged or locke
7. " the spied control valves to the gauge lagged down.
8. Using controll knob set the follow up pidicus to the gyro indicating
9. Set the level control to off.
10. " the engaging lever to on and with engi on but operation by moving the control knobs and noting the controls move in the correction, they should move at approx, equal spe either way and should not unlock or hunt and come to rest immediately.
11. Disengage gyro. pilot.

Dib. Layout.

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Drain Trap. -

Provides a means of returning drainage oil to the system consists of a copper float, an outlet valve and two three connections. The lower connection is connected to the sump pump suction line the top connections are connected to the drip tray or the drain manifold the remaining top connection acts as a vent to atmosphere. The drain trap should be fitted below the level of the drain manifold but not more than 5 ft. below the level of the pump

The c/s controls should indicate when it detects air in servo motor.

Removal of air from Servo Motor.

Engine switched on

Engage lever switch off. Hold c/s control to outlet stud in each direction for 30 secs. this should remove air from servo motor (M.B) retest for air in servo motor

MK.IV. clutch controls.

Filters (13 in all)

Air Relay	6
Bank and Climb	2
Directional Gyro	1
Sperry Suction R V	1
Pesco suction R V	1
Oil sump	1
Main oil filter	1

A.K.II auto Control (68-16)

Compressor:-

To Supply air to the system 60-66 lb. sq. in. to spin the rotors of the gyros. and give the operating power for the servo motor.

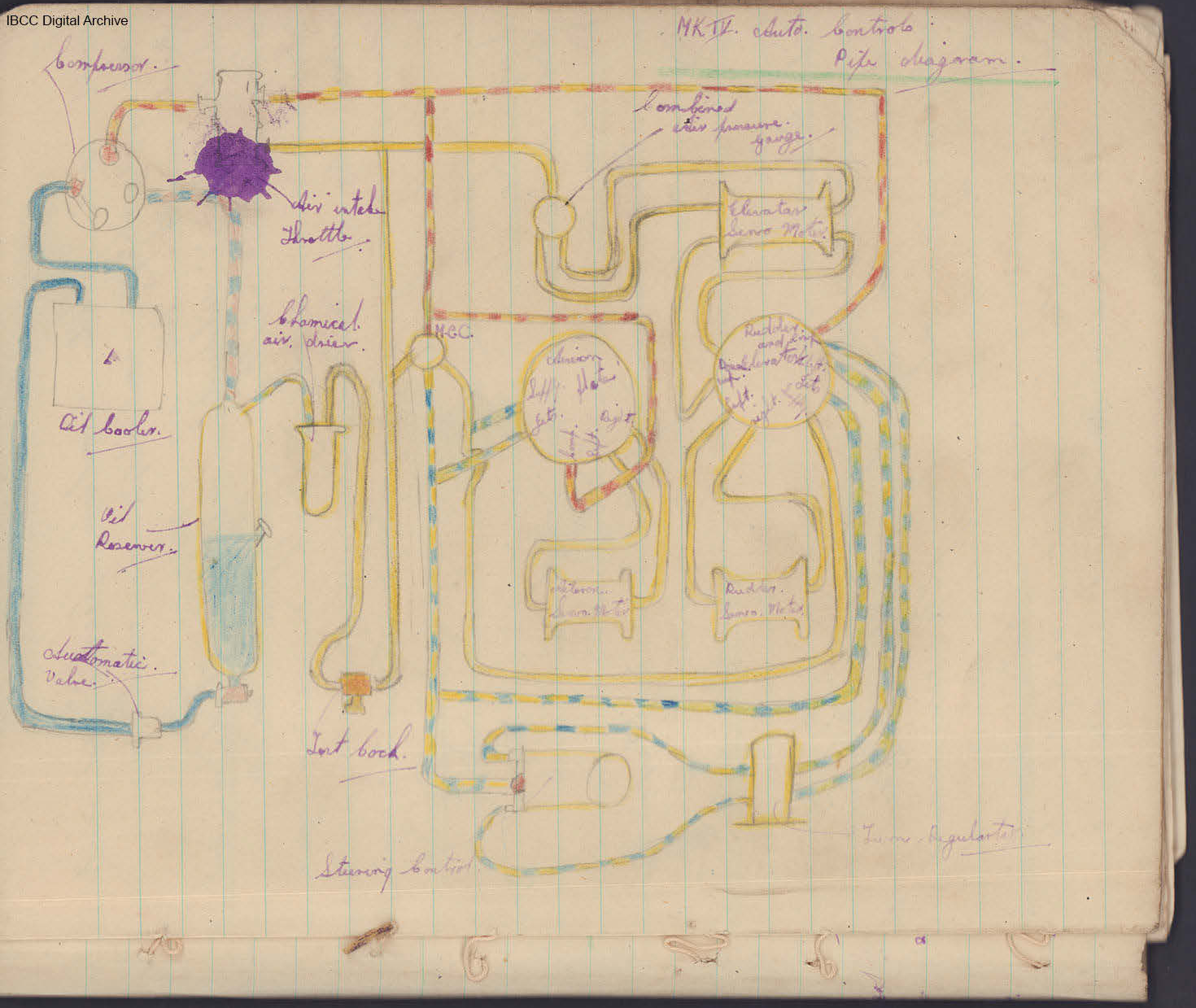
Description.

It has three connections the oil inlet air inlet and oil and air outlet.

The oil inlet + air inlet have the filter and care should be taken to ensure after cleaning that new annealed washers are placed either side of the banjo union before replacing. An arrow on front plate indicates direction of rotation. The connections to and from the compressor are of auto flexes. The

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rear cover plate contains packing and nut
the packing consisting of asbestos yarn
treated with talc and graphite the shaft
shaft is deliberately weakened about one inch
along the shaft end is known as the sacrificial
neck. This ensures should a compressor seizure
occur the main shaft will break. Less
damage can be done to the engine
or craft shaft.

Daily Inspection.

Test for general and leaks.

First Minor Inspection.

Remove the filters wash in M.T. petrol
replace making sure that the
washers have been annealed.

Oil Reservoir.

It is used to store oil it lubricates
and seal the compressor. It also partially
separates the oil from the air coming
from the compressor. Threaded into the
bottom is a spring loaded barrel
filter with an outlet leading to the
thermostatic valve and oil cooler.

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Fibre washers are used where required to make connections air tight.

Daily Inspection.

M.K.III Type.

Fill to the level of the filler cap. with anti-freezing oil. check for general security and leaks.

M.K.III. Type.

Set Levels on gauge vertical answer filler cap. fill in A/F oil until the oil level in the glass reads the white spot mk. replace the filler cap. and locked the Levels in a Longitudinal position

First Minor Inspection.

By means of the drainage plug at the bottom drain of all dirty oil remove the filler waste in M.T. and replace fill up with A/F oil as on a D.I.

Automatic Valve.

This is a one way valve and is fitted near to either rear compressor or

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the oil reservoir which ever is lowest in the system. It is designed to keep the life line full of oil, but without flood the compressor. It must always be fitted with the arrow pointing towards the compressor.

Oil Cooler.

This is similar to a long comb and is fitted between the oil reservoir and the oil inlet on the compressor. It is fitted in the life stream to cool the oil to an reasonable temperature

Daily Inspections

Check for general security and

Chemical Air Drier.

Is installed to observe any moisture in the air, and so prevent it from entering the system thus eliminating freezing etc, It is fitted in the life line between the oil reservoir and the cock.

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Method of changing

Remove inlet container empty the contents and wash in petrol. The outer container must or should be washed with soap + water.

1) Fit a gauge disc.
2) Fill to within ½ ins, within the lot. with oil to get
3) Fit the other gauge disc, & place layer of new cotton wool on top of gauge disc making sure it is tightly packed.
5) Replace the cover on the container + screw into position on the bracket attached on the a/c. making sure the rubber washers are in good order

MK IV. Type,
Will last for three engine hrs.
MK. V = Will last for ten hrs.

Set back. MK IV.
It has two positions flying and test.
In the flying position air passes from the C, A, R, to the M.C.G. In the test position pressure is cut off from the compressor and a connection made to the portable compressor. so enabling the system to be

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tested on the ground. The test cock is not bolted to the c/p but in the pipe line by two screw air tight unions
When the test cock is in flying position it is locked by an arm engaging on a pin attached to the handle

Test Cock. M.K. II & II (Automatic Type).
Changing from flying to test position takes place automatically by means of pressure operated on a plunger.

Servicing. D.T.
Should a leak occur or a faulty washer wash in petrol. When necessary that the rubber washer on the plunger is kept moist
The test connection
Should be screwed on hand tight and locked by means of the locking

Air Intake Throttle.
Purpose —
1. To maintain the pressure in the

at 60 lb per sq in. above atmospheric pressure.

2. To act as an unatum valve. when the engine back fires it has three connections the left one from the regen. center one to compressor and bottom one from main supply.

an arrow indicats the direction of flow of air to the compressor. There is a filter at the inlet this is called the breather. The two atmospheric vents are connected to the inside of the selfbuno bellows to prevent compressing of air which would give errors in the output of the compressor

Servicing. (DI)

Visual defects security.

Minor Inspection. Also DI only clean filter.

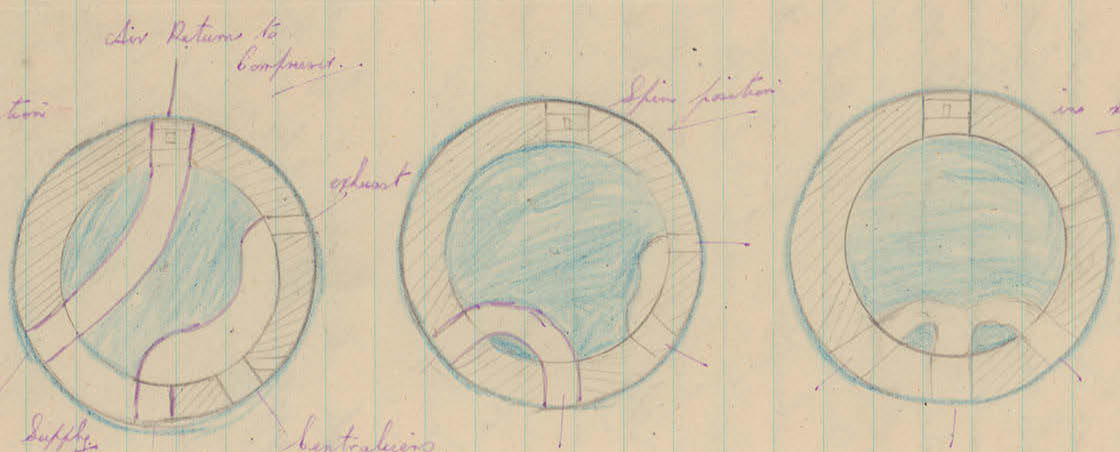
Main Control Lock.

Purpose - To provide a means by which the pilot can engage the elect, controls after spinning up the gyro.

Description

The casting has four connections and one vent to atmosphere. The barrel is so drilled that a passage of air from the inlet can travel

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to any of the outlets as required.

The W.C.C. has three positions and the barrel is rotated by a handle into any one of three positions. They are out, spin, & in. In the out position the air go back to the compressor by the regen system. There is a restriction disk to ensure an undiate build up of pressure when the compressor starts.

In the spin position the air goes to the spin jets also to the steering controls.

In the IN position air goes to the centrifugin and the main valves and also to the same positions as in spin.

Installation

The handle can be put in any one of 6 positions, and a datum line on the barrel and one on the casting are to indicate the out position of the W.C.C. when they are lined up.

The plate on top is removable and with the datums lined up and the handle in the out position for use this plate must be

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replaced with the word out against the handle installed in pilots cock pit

Servicing (D.T.)

Set for freedom of movement and security and have the handle in the out position

The Steering Control.

Purpose:—

To enable observer or bomb-aimer to change the course of the A/C. while under Auto, controls as desired for bombing runs etc, Fitted in the bomber-aimer compartment having three connections the centre one being the inlet the air coming from the M.C.C. in the afin and in position the other two connections are the outlets to the course change valve viz, the turn regulator the inlet connection has a filter which is made up of two gauze discs and cotton wool held in position by a circlip

Servicing (D.T.)

Set for freedom and security ensure

Section Systems.

Let the control body springs back centre position

1.

First Minor Inspection.

D.I. plus clean filter

Steering Lever.

It is fitted in the pilots cockpit and is to enable the pilot to change the course of his a/c under automatic controls, and is connected to the steering control by bowden cable.

Note:-

At the rear of the steering control there is a rate of turn adjuster this is adjusted to the no. of degrees as layed down for the particular a/c in the a/c Manual.

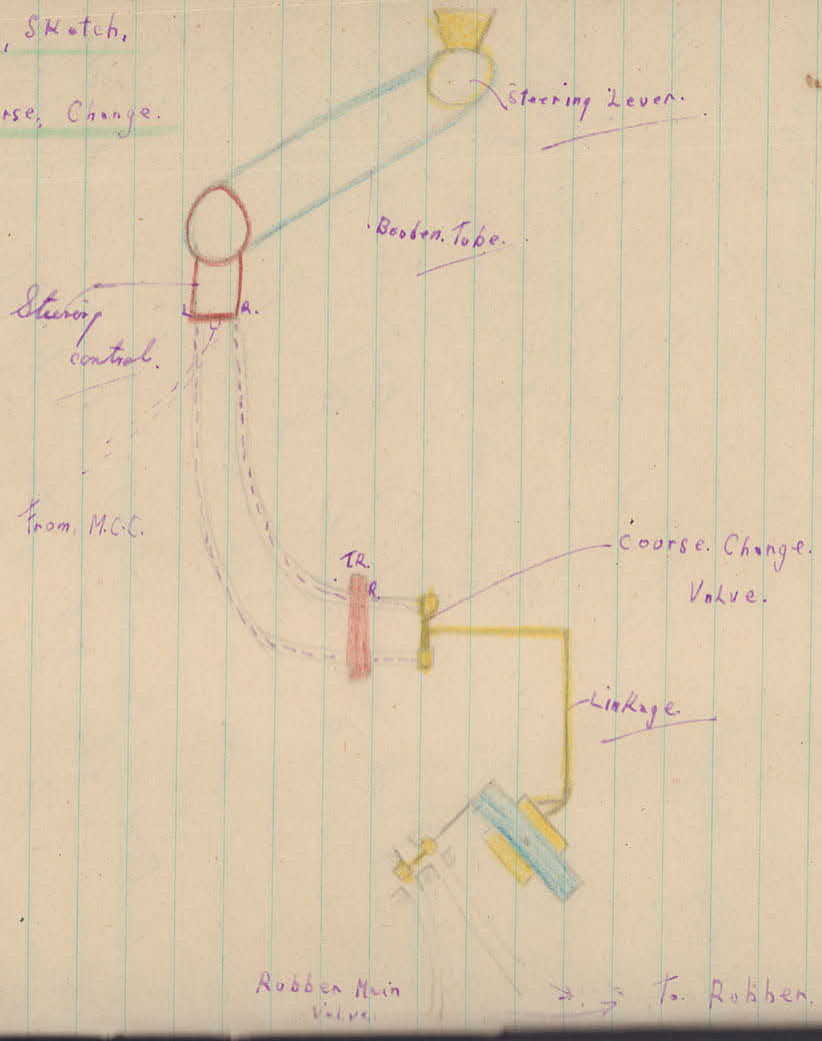
Combined Air Pressure Gauge

This gauge is used to indicate the pressure in the system also as an indicator to the f/aft trim of the a/c.

It has three connection at rear. A, B. Up, and C. down, Connection A will be T. in the supply pipe line between the test cock and M.C.C. Connections B + C are

Diagramatic Sketch.

Showing A. Course Change.



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connected to either side of the elevator S/M.

1/10/43.

D.I. C.G.C.V.D.S. and with engines running the pointer on the right hand side of the dial should read 60. lbs pr. sq. in.

Turn Regulator.

In many modern A/C it has been found that they will not turn at the same rate as the outer gimble ring. The result is that for that the G.R. moving faster than the A/C. the centralizer pin touches the cone and the gimble system tilts, This happens when the outer ring has exceeded the turn ~~of the turn~~ of the A/C by 16½ degrees.

D.F.

Check for general security switch on and note that the electric magnetic becomes energized.

Note:- The turn Regulator operated by two contacts in the A and E plate Stops the outer ring preventing the contacts are broken when the pin on the out ring engages with the long contact this takes place when the outer ring has exceeded the A/C turn by 16½ degrees.

Servo. Motors.

The s/m. consist of an out side casting with two pistons inside each nedgetly attached by a dooted rech.. Movment of piston & rach rotate a pinion attached to a shaft on which is carried a pully or a chain sprocket this sprocket is connected to the c/s. controls,

A relase clutch is provided which enables the pully to rotate freely. ~~with~~ the clutches in the out position.

A second pully is keyed to the same shaft and operates the follow up cable thus moving the follow up units on the back of the plates.

D.F.C. For general security make sure that the clutch tongue clearance is 50 thou with the clutches in the out position.

Engage the clutches and operate c/s controls manualy until the clutch tongue fits into the groove in the clutch plate.

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3/10/43.

Centralizer R.E.

Purpose:-

1. To lock the gimble system when the a/c is taking off and landing and with M.C.C. in the out and spin position.
2. Supply air to the main valves with the M.C.C. in the in position.
3. Exhaust the air from the S/M. when the M.C.C. is in the out spin position.

3/10/43.

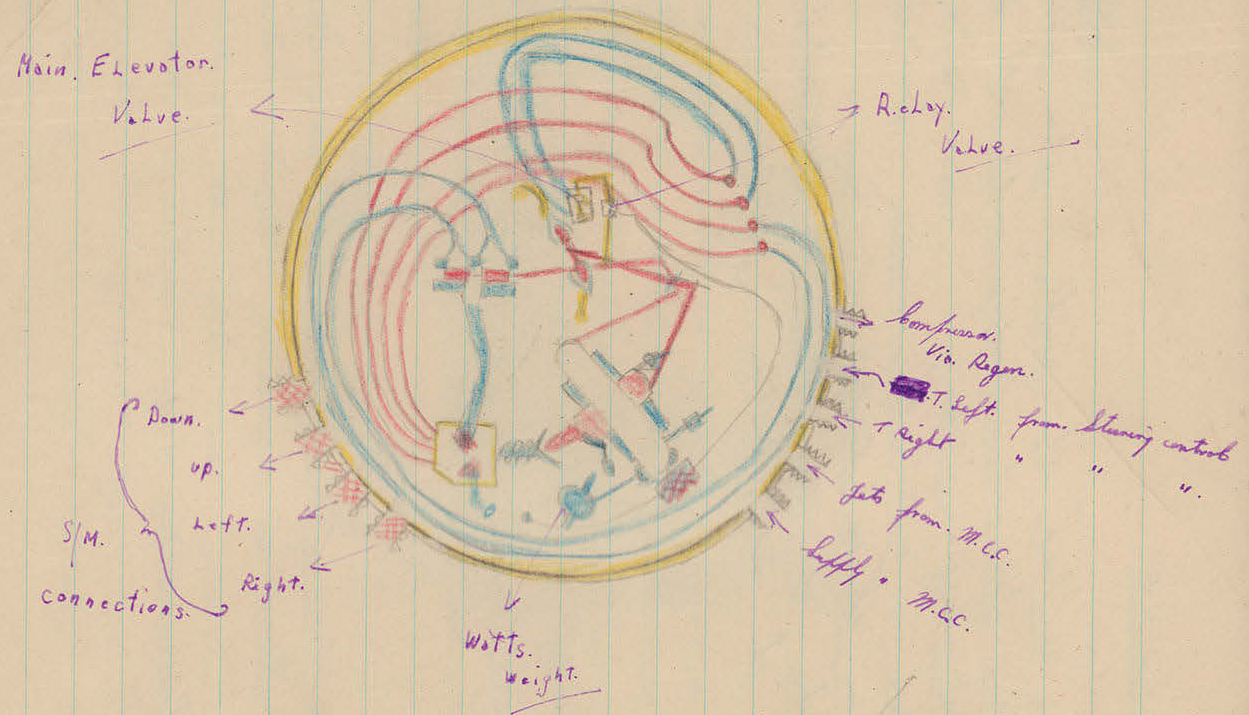
Action.

When pressure enters the inlet from the in position of the M.C.C. it passes into the front of the piston forcing the piston back against the tension of the spring. The cone is thereby moved away from the centralizer pin the rubber washer attached to the piston seals off the ports from the S/Vs. closing them from atmosphere.

The Relay Valve.

The relay valve is fitted to prevent oscillating this would result from the air passing through the back bonnet being applied to the inlet and the result would be bad cause hunting

Rudder. Hnd. Elevator. Plate.



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31/10/43. This is eliminated by attaching the fairy piston to the inner ring linkage and the relay valve relaying the movement to the main elevator valve.

The Watts Weight.

Purpose.

It is fitted to counteract the effects of centrifugal force on the act of the balanced mass of the jimble system. It also acts in spelled stabilization and aids the mass balanced weight to make the inter ring to conformed to the caricture.

Rudder and Elevator Unit.

It consists of two parts, the frame which is bolted to the port side of the A/C. and a base which is carried on the frame and allowed to rotate. The base can be rotated by means of bowden cable from the pitot attitude control. The jimble system is connected to the base by pivots tops and bottoms of outer ring and are of set 15°. The rotor spins at approx. 18 to 20 thousands rev, per, min, and is forced round by a two jet The jimble system is connected to the watts weight which tilts forward 15° this given pitot stabilization it is locked by means of the centrifuges lagers immediately above the watts weight. The rudder valve is a

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attached to the outer ring while the relay valve (elevator) is attached to the inner ring. Six pairs of term regular contacts are mounted on the top of the outer ring, between which is the contact breaker attached to the outer ring.

Position of Tilters.

Rudder. Hnd. Elevator. Plate

R. & E Plate.	Sub.	Main
Rudder main valve.	3.	
Elevator " "	3.	
Relay. "	1.	
Course change "	2.	
S/pin jets.		1.
Centralizer		2.
S/H. Connections		4.
Aileron. Plate.		
" Main Valve.	3.	
Precessing "	1.	
Centralizer	*	1
Supply.		1
S/pining jets		1.
S/H connection		2.

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Filters on Components.

Compressor. 2.

Oil Reservoir. 1.

Pneumatic Air dome 1.

Air intake throttle 1.

Steering control 1.

Datums.

1 Datum on fixed and rotating part of the plate. to indicate the position of the plate when the attitude it at zero.

2. A datum on either side of the base plate which should be in line with the f/aft axis of the A/C.

3. A datum on the pinion and base plate under the dust covers for the purpose for getting the valve central in their slides during installation..

4. Datum on valve casing and valve slide for the purpose of getting the valve casing central over the valve by fine adjustment of the bowden cable. (3 + 4 effy to the rudder + Elevator (follow up system

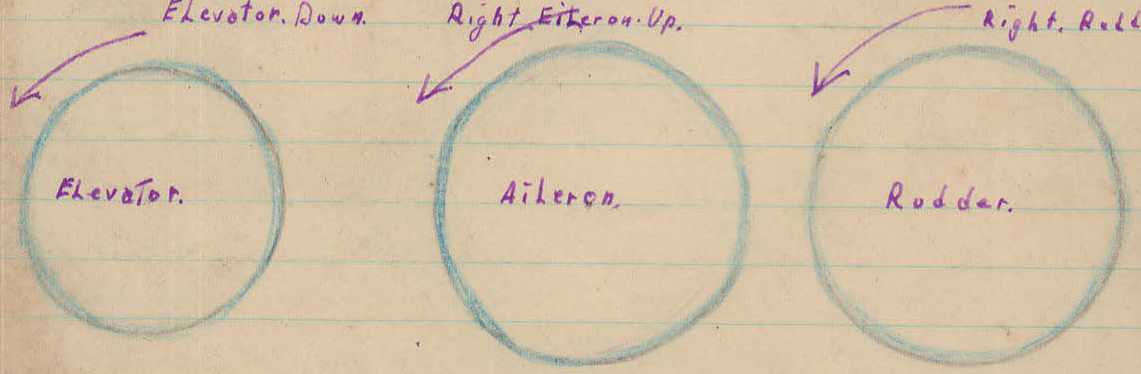
5. A datum on the rack and pinion of the S/M. indicating the centre of travel.

6 A datum on the M.C.C. to indicate the acc. in the out position

Rudder and Elevator [illegible]

Fitting Of The Follow Up Cable (Or. Spring)

Fit the follow-up pully onto the axell of the serrated drive taking care that the clutch pin engages and that the loop in the spring fits over the pin projecting from the mounting unit. The servo motor piston must be placed in an extreme position and the cable attached to the short end attach the cable to the piston by a shackle and pin pass the cable round four pullys and lead it to the back of the mounting unit wind up the spring in the pully on the mounting unit to its fullest extent and release a quarter of the turn pass the cable over round the pully and through the hole provided Mark the position where the cable passes through the hole, tie a knot on the cable at this point Solder and cut of spare cable account installation may be checked by the movement and direct of the follow up pully



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Silvron Plate.

Processing Valve and torque motor

Purpose.

These are fitted to the Silvron unit and cause the outer ring to process at the same speed as the A/C is turning.

Action.

Air is led to the processing valve from the spin position of the MCC. the valve casing being attached to the base plate

and the piston attached to the outer ring any movement of the A/C in a turn will cause the casing to move over the piston. This allows air to pass to one side of the torque motor piston movment of the torque motor piston thereby will cause a linkage to move applying a torque to the inner ring. This torque applied to the inner ring causes the outer ring to process at the same speed as the A/C.

Silvron Controller.

Purpose.

Enables to find if the outputs on the R.I.E Plate is one of a [illegible] type and the power supply with a pin attached to the inner ring. Care must be taken to replace the plastic pin each time after carrying out a D.F. taken to do

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would automatically make the unit W.S. The inlet
filter on the centrifuge is situated on the supply
connection outside the unit the outlet is situated
on top of the unit inside

The Gravity Weight

Purpose.

To counter act the effects of pitch accelerations and
to act as an extra gravity control.

Daily Inspection MK IV.

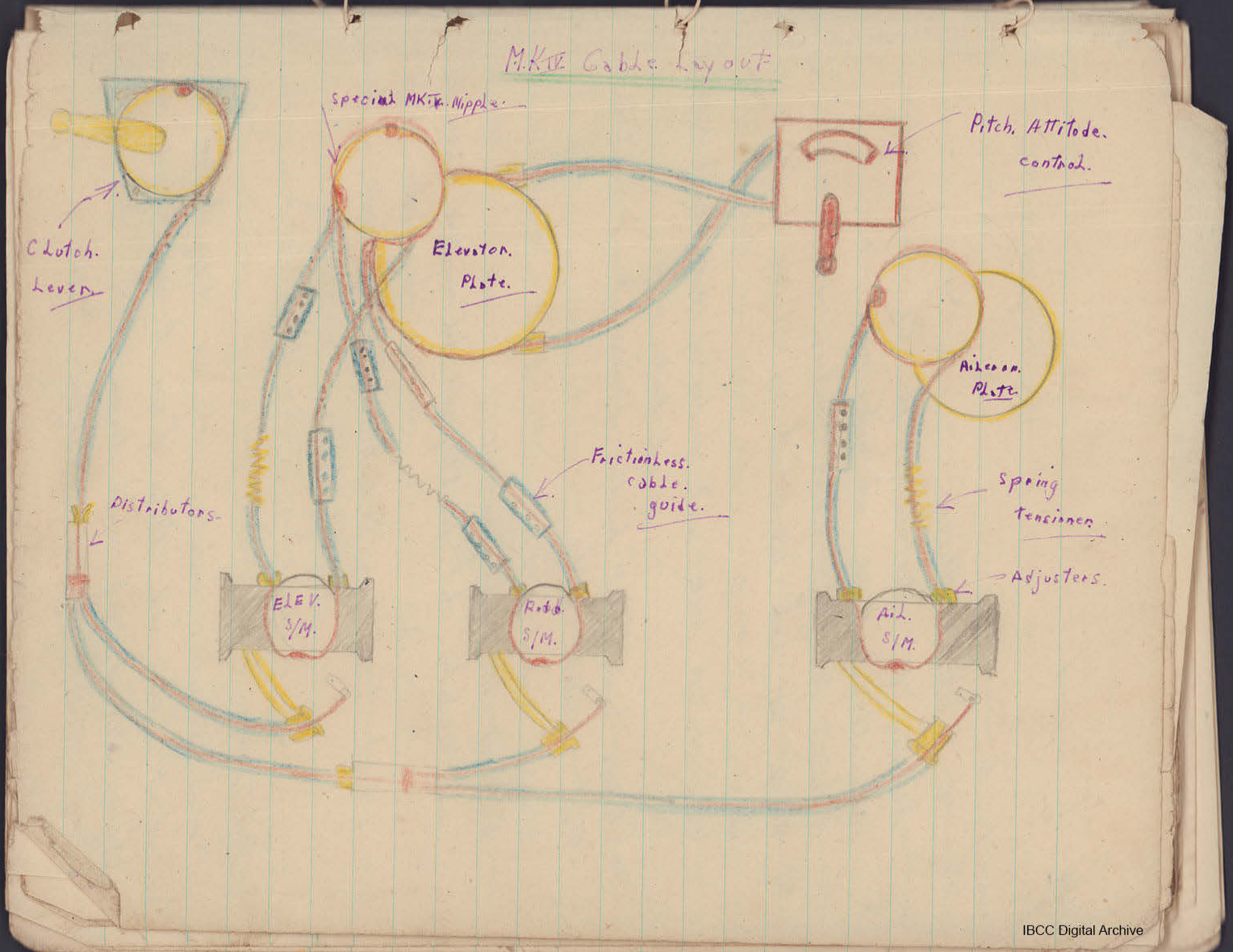
R. and E. Unit.

Remove cover, decentralize, test rotor for freedom, and outer
ring for end play. (.005 ins). Examine all flexible hose
or rubber piping, test all valves, pistons, and slides,
and oil all moving parts with one drop of A/F.
Test security of weights examine all bowden cables
ensuring they do not foul the plate when it is
rotated. Recentralize, remove the surplus oil from
cover examine cork washer for damage and replace.

Aileron Plate

As above, but note that the centralizing
cap had to be removed to allow the
decentralizing key to operate therefore cap

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ment be replaced.

Components.

Air Intake throttle. V.D/S.

Compressor. V.D.S. also security of pipes. and examine for leaks.

Automatic valve and oil cooler V.D + S.

Clinical air chair. V.D.+S. recharge if necessary.

HK. IV Int lock V.D.S. & lock in flying position.

HK. V " " " "

Main control lock. test freedom of movement and leave in out position

Steering Lever. test freedom of movement and leave central

Pick Attachtch control " " " " " "

Steering control " " " " " " "

Combined air pressure gauge V.D.S.

Steam Regulator. test functioning and put one drop of s/f oil in the piston

Clutch Lever. V.D.S. check the (005) clearance and leave clutches in.

Installation.

Follow-up cables including fitting and stiffy of S/M.

1. adjust the end plates of S/M. to suit position in s/f
2. Remove 2BH nut and clutch tongue
3. " spring loaded plunger.

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4. By means of S/M hub extractor remove clutch plate from spline shaft.
5. By using 6 No. BA bolts remove follow up fully and dowel plate.
6. Adjust position of stop plate to avoid bends in cable.
7. Set the S/M. central by datums.
8. Remove dowel plate and follow up fully so that the middle is 180° away from the centre of the dowel holes.
9. Replace clutch on spline shaft using assembly tool.
10. Grease and replace spring loaded plunger and refit clutch tongue register.
11. With the S/M. central note also that datums under dust covers and valve slides are in line proceed then to fit cable.
12. Tension cable by means of the adjusters until keeper just snaps off.
13. Test for correct operation by movement of rudder bar and control column, note correct rotating of follow up fully and control surfaces.

Steering Lever and Steering control cable.

1. Set datum on steer lever fully and datum on base.
2. Set datum " " control " " " casting.

Set bowden stops on steering control and base

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nipple in the slot opposite the adjusters

4. Ensure that when the S/ lever is moved to left adj. will also move to left.

Clutch Lever.

A single cable is lead from the clutch lever into centre nipple slot of the slider in the distributor. Two cables are lead from this, one to another slider and slot and the other to the S/M so giving three cables to the S/M. With clutch in these should be slack in the cable and should be ⅜ down the distributor cover. With clutch out clutch should be clear of the clutch plate ¼ (.005"), any adjustment to be on distributors on S/M.

Pitch Attitude controls.

1. Ensure P.A.C. is installed with datums on front cover and levers aligned so that the oil hole is at the top.
2. Remove front cover, and with P.A.C. reading zero locate arm with ¼" nipple in its slot.
3. Set up datum on rotatable platform with arrow head on face plate and locate cable around plate with ¼" nipple in it.
4. Test for obvious rotating of unit when P.A.C. is moved to check characteristics of the cables.
1. P.A.C. along length of lone cable and ¼" + ⅜" nipples, two adjusters and cable crossed arm installed.
2. Steering lever to ... rig control cable. short length of ... cable ¼" + ⅜" nipples 2 off. two

there are seven terminals which are N° 1 to 7. and are also ~~colour~~ coded, One main switch operates all systems together (Diesyn system)

Installation.

D.1 C-G.V.D.S,

Switch on main switch and see that the dials indicate the amount of fuel, + oil, etc.

30 hr.

Inspect wiring terminals fuses and general security

30* hr.

Same as above only check calibration of transmitters and indicators.

Telegon. Equipment.

The equipment is installed only in American A/c. and these Boston, Havoc, Helmore, The instruments which employ this system are 10 in number and are.

1. Oil pressure. 2. Oil temperature
3. Fuel " 4 Air intake temperature

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5 Nose Wheel.
6 Port "
7. Stbd "
8 Flap. (position indicator)
9. Manifold press or Coast Gauge.
10 Fuel contents.

The advantage of the system are many and include the following:-

1 Easy maintenance and testing
2 Space and weight saving.
3 Extreme accuracy.
4 Interchangeability and easy replacment.
5 Less Loose wiring.

Instrument	Socket No.	Code Colour	Connection at rear.
Oil Pressure.	Jes 6 pin plug	yellow	Pressure connection + two flexes.
Oil Temp.	"	"	Bellow capillary + bulb
Fuel pressure.	"	Red	Pressure connections are flexible capillary + bulb.
C. A. I. T.	"	"	
Nose Wheel	"	Green.	small pinion
Port "	"	"	"
Stbd "	"	"	"
Flaps	"	"	lever + stacked spiral
Manifold press.	Jes at opposite end.	No. Colours.	press. connection
Oil Contents	6 pin plug	" "	3 connections

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Pressure Gauges Transmitting Type Fuel And Oil Pressure Gauge

In this type of gauge the pressure being measured is not in direct contact with the gauge, but is admitted to a closed case containing a flexible capsule, the inside of which is connected to the instrument by means of a copper capillary tube. The capsule, capillary, and bourdon tube are completely filled with a special fluid usually alcohol which acts as the transmitting medium. The system prevents loss of fuel and oil pressure which might be caused throught a faulty instrument.

Daily Inspections. To clean glass visual depths and security.

30 hr Inspection Test functioning on ground test

30th " " Examine capillary for kinks and dents and security.

To Take For "HYDR" System

Purpose — To protect the gauge from flow.

Installation.

1) Install the pipe line to the choke. (Petrol 50. Oil 3)

2) Connect inlet to pipe line with

pointing to the (dail) gauge, leave half turn loose.

3/. Leave two parts of the choke half turn loose and connection to gauge half turn loose.

4/. Turn on oil and ensure it leaks freely from connections especially instrument one.

5/ Tighten connection

Note.

Dont attempt to alter choke jet if removed to clean filter proceed as if installing a fresh choke.

Three types of unions on instruments.

1/ Nipple adaptor union

2/ Soft soldered spherical nipple union F. P. G. direct type

3/. Spigot union.

Transmitting Oil or Fuel Pressure Gauge.

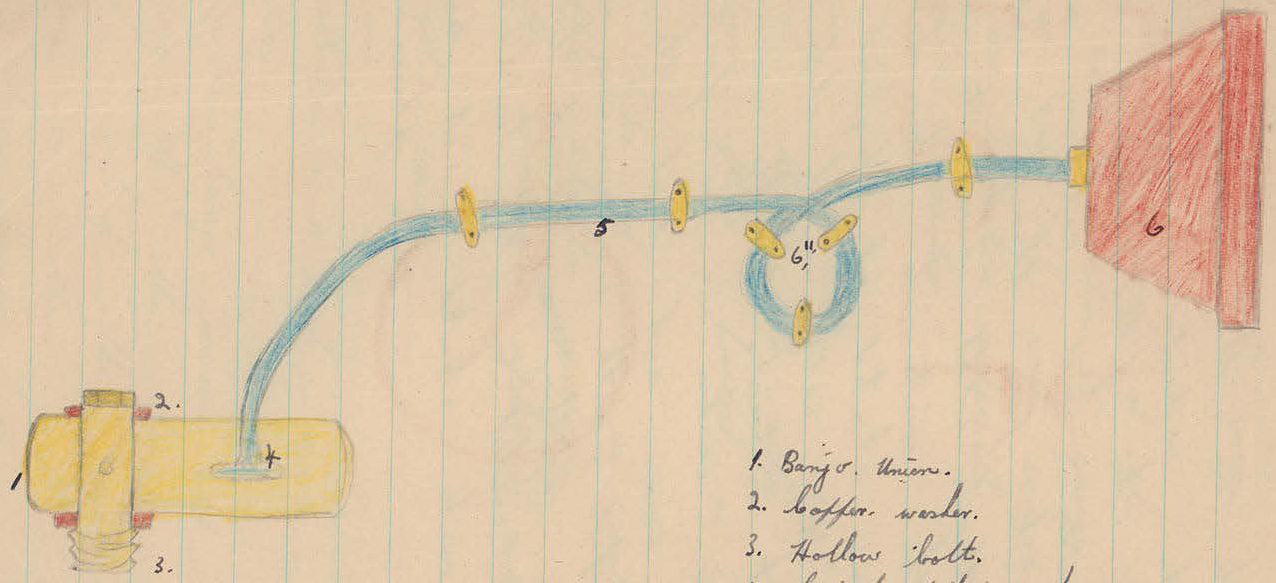
Installation.

Remove banjo union and capillary by unwinding off the drum not drawing off belly. If the instrument is to be mounted on the front of the panel, the banjo union and capillary

through the hole in the dashboard
then secure the indicator. If
indicator is to be fitted behind
panel the union and capillary will
not have to be pass through. The
union and capillary will have to be
passed along the route to be taken,
the capillary being cleated at frequent
intervals (approx, every ft.) with metal clips lined
with some resilient material. Finally ensure
that the copper washers are in position
when fitting the union, and that the
capillary is looped with a minimum radius
of 5/8 in any spare capillary must not be cut,
but is to be coiled on the bulkhead
in approx. 6" dia. coils cleated in at least
three places.

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transmitting Oil or Fuel Pressure gauge.

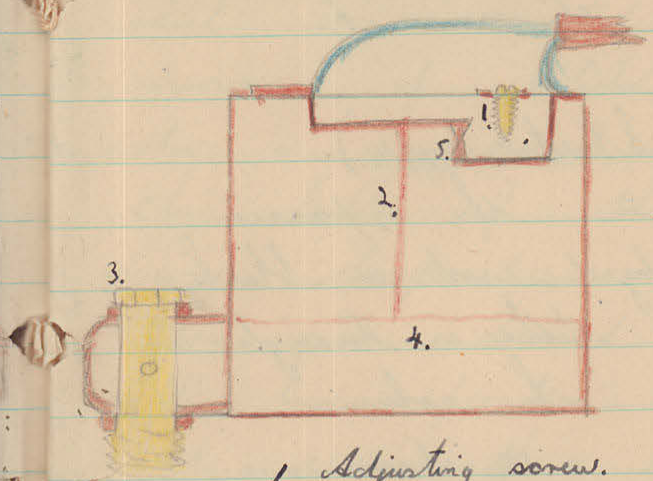


1. Banjo Union.
2. Copper washer.
3. Hollow bolt.
4. Capsule filled with ethyl. alcohol.
5. Capillary copper filled with ethyle alcohol.
6. Bourdon tube filled also with ethyle alcohol.

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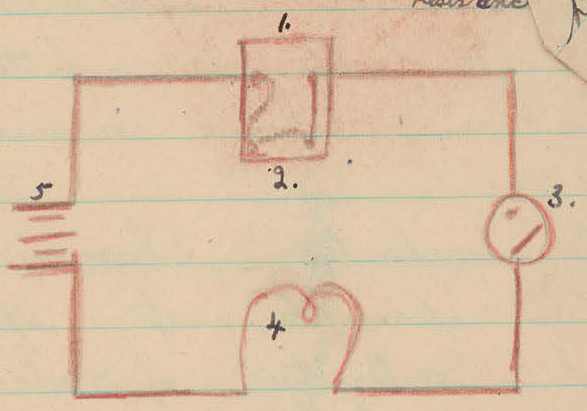
Fuel. Pressure. Warning Lamp.

Pressure. Unit.

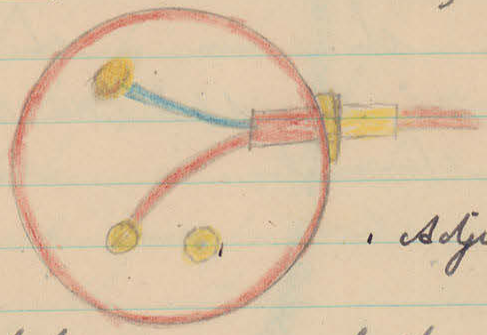


1 Adjusting screw.
2. Pin.
3. Hollow bolt and copper washer.
4. Diaphram.
5. Contacts.

Resistance



1. 24 Volts.
2. 12. "
3. Press. Unit.
4 Warning Lamp.
5. Acc,



1. Adjusting screw.

Purpose.

To give warning if fuel pressure falls below correct value.

Consists.

1, Pressure Unit.
2. Resistence
3. Warning Lamp.

Installation.

Pressure unit is secured to engine by

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allow bolt after it has been adjusted
warning lamp is fitted on instrument panel,
resistance where convenient in the circuit.

Air. Temperature Thermometer. (Strut Type)

The principle of operation is the expansion and contraction of alcohol, dyed red or black, in a glass tube. The tube is triangular in shape, so as to magnify the column and make it easily visible in a 1/4 degree. arc. when seen from a distance. A sun shield is fitted over the bulb it protect it from direct rays of the sun, the range of the therm, is from -40° to and 60° (MK. V.B.) and -35° to and 55°C (MK. 2
The thermometer is strapped to the port outer interplane strut, out of the slipstream of the aircraft.

The boiling point of alcohol is 78°C.
The freezing point of " " -130°C.

Air Phychrometer. MK V.

The purpose of the instrument is to give an illustration of the amount of water vapour in the air. It consists of two alcohol - in - glass thermometers

mounted side by side. The bulb of one thermometer is enclosed in a muslin bag which is connected by a wick to a reservoir of distilled water, evaporation of the water is accompanied by loss ~~of~~ in heat, consequently the bulb, of the wet thermometer is at a lower temperature than the dry bulb. The more humid the atmosphere the less will be evaporation from the wet bulb and consquently the loss of heat will be less. The difference between the two readings, or "wet bulb depression will therefore also be less.

It is the difference between the two thermometer readings which gives the indication of the amount of water vapour in the air, and an inspection of the tables in A.P. 1275 will show that the greater the difference between the readings the less the humidity and vice versa. It is most important that the dry bulb should meet the airstream first. The instrument must be placed with particular side forwards and the side is so marked. as the dry bulb is mounted on

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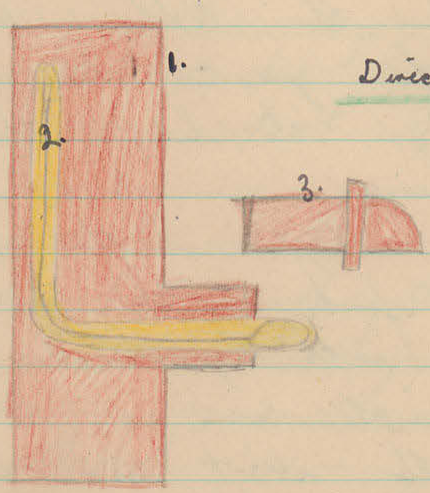
the left of the assembly the instrument must be mounted on a starboard strut.

Installation.

The instrument is designed to be strapped to the starboard interplane strut (outer) of the biplane, so that the long bulb is forward care should be taken to ensure that the instrument is in the pilots line of vision.

Maintenance

The instrument should be periodically cleaned and the muslin bag and the wick should be washed and rinsed in distilled water the straps need periodical attention



Direct Air. reading. Thermo temp.

1. Frame.
2. Glass. column. contains benzene
3. Sunshield.

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Purpose.

To show the air temperature, this type will replace capillary and electic types on 4 engined aircraft.

Installation.

The scale is fitted inside the aircraft where the observer or pilot can see it. The bulb protudes inside through the aircraft skin and is protected by a metal sun shield.

Maintenance.

See that the scale is legible and the pile mark on the glass is opposite zero on the scale.

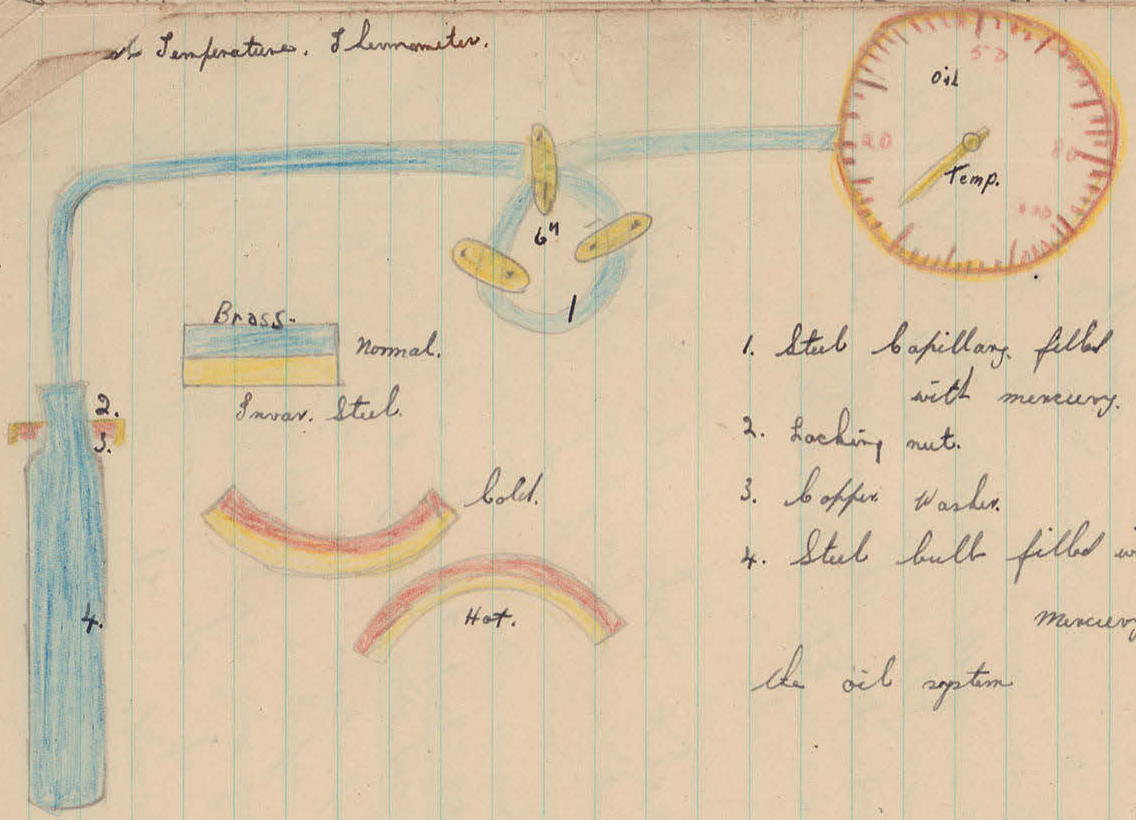
Oil. And Air. Temperature Thermometers.

Both these instruments are required to indicat temperatures less than + 40° C. consquently the vapour pressure type would not suitable.

The mercury in steel type, which is really an adaptein of the mercury in glass type. is show for used. The instrument may be considered is consisty of 3 parts —.

1/. The bulb in both case is of

Temperatures. Luminometer.



1. Steel capillary filled with mercury.
2. Locking nut.
3. Copper washer.
4. Steel bulb filled with mercury. and goes in the oil system

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and is completely filled with mercury. The bulb of the air temperature thermometer is long and copper coated and enclosed is a ~~copper~~ metal shield to protect it from the direct rays of the sun. The bulb of the oil temp. therm. is similar to that of the Radiator Therm. has a rounded end.

2/.

The capillary (.006 in bore) is of steel and covered with a protective braiding. It is completely filled with mercury. When the capillary of the air temp. therm. exceeds 20. ft. in length, temperature compensating links are fitted at intervals of 20 ft. These links consist of an enlarged portion of capillary containing an invar steel rod.

3/.

The indicator is of the bourdon tube type the tube being completely filled with mercury. The bourdon tube takes the form of a double spiral spring to the inner coil of which a bi metal spiral is fitted for temperture compensation.

Installation.

So similar to that of Radiator thermom

Maintenance

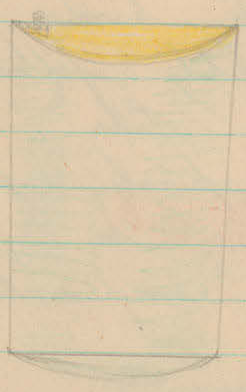
D.I. – Clean glass and inspect for visual defects
the indicator should be reading the temp, of
time of the inspection.

30. hr inspection. Test oil temperature for correct func
on ground test.

30+ hr " Examine capillary for kinks and chafe
security.



1. Copper Washer.
2. Steel bulb (copper coated)
Mercury filled.



Sun Shield.

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Reads the temperature of the days.

Height	0	5000	10000	15.00	20000
Air Speed.					
150	2.	2	2	3	3
200	3	4	4	5	6
250	5	6	6	7	9
300	7.	8	9	10	12.

Comprision Error. Card.
Correction to subtracted from reading.

Air Temperature MK. III.

Similar to MK. II. expect that the bulb is fitted in a case from which it cannot be removed. The case is mounted flush with the mainplane and insulated from it is to fibre washers. No Error Card is required. D.T. and maintenance as for MK. II.

Radator. Thermometer.

The instrument has been design

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to indicate to the pilot the temperature of the liquid in the cooling system of the engine. The principle of the operation is that the vapour pressure of ethyl. ether is a definite figure for given temperature, at vapour pressure is not of until a temperature of 35°C. is reached

The instrument may be considered to consist of three parts.—

1. The bulb of brass and copper. (flat and end) is two thirds full of liquid, the the remainer of the space being vapour, the tube reaches half way down the

2.

The capillary of 1.17/M. bore, also of copper completely filled with liquid.

3.

The indicater is of the bourdon pressure type, the tube being completely filled with liquid, the bezel is coloured blue to indicate water. On some types there red markings on the scale to warn the pilot of reducing B.P. at light.

Maintenance D.T. b.g. V.D.S.

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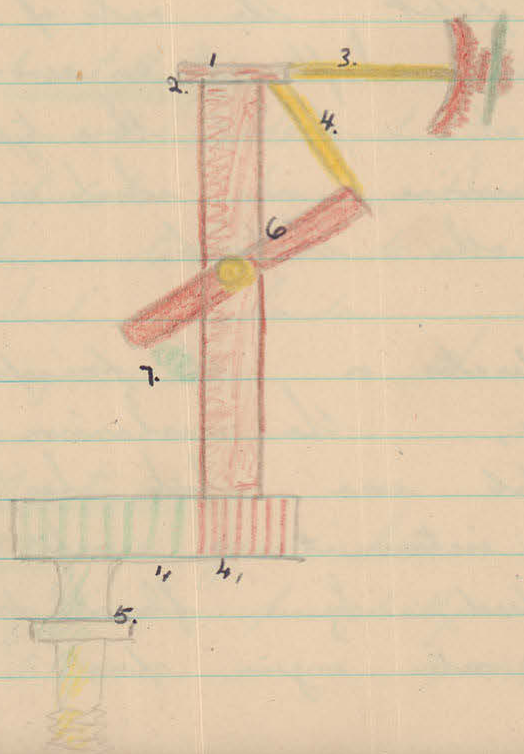
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30 hr. inspection. test functioning on ground test.
30" " " examine capillary for kinks and dents.

Thermometer. Calibrator.

The master thermometer and bulb of instrument under test are clipped together and placed in the can, hot water is then poured in, The water must be hot enough to allow a first reading of 90° to be taken, then as the water cools, the reading of the master thermometer and instrument dial should ate checked at 80°C. and 70° C.

E.S.I (Meal)



1. Spindle.
2. Collar.
3. Quadrant.
4. Link.
5. Instrument end connector fitting.
6. Centrifugal Governor.
7 Spring.

Flexible. Drive.

Brass. casing.

Drive held in place by split washes at each end, one must be taken off to remove drive, The casing can be slightly lengthen or shortened by screwing it.

Steel casing.

Drive has collar at one end. and can can not be adjusted

Mechanical. Engine Speed. Indicator. (E S I)

These instruments have been des to indicate to the pilot the rate revolution of the crank shaft of an a engine, There are at present three employed in the service, one which mechanical and two other electrical.

Mechanical. Type.

The instrument operates on the prin of the centrifugal governor, the mechanism is enclosed in a metal case which h circular dail, The instrument is usual driven at engine speed by a flexible wheal runs at a quarter engine speed

order to reduce wear, To make this fou
gear boxes of various types are employed.
drive consists of several layers of steel wire
wound in opposite directions to provide flexibility
and strength, This runs in a flexible brass
outer casing, To the ends of the drive
are soldered squared connectors, The drives are retained
in their casings by means of slip washers,
and they should have $\frac{1}{8}$ to $\frac{1}{4}$ play.
Holes are drilled in the engine end of
the flex drive to prevent oil pressure
forcing oil along the drive casing to the
instrument.

Installation.

Flexible drives should be supported at
intervals along their length and care should
be taken to see that there are no
sharp bends, A carelessly fitted drive
may cause the indicator pointer to fluctuate.

Maintenance -

D I - Gear boxes and drives should be
greased periodically with anti-freezing grease.

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Aircraft clocks.

Clock. MK. I.

Since this clock was for use in sea planes and flying boats, it has to be water tight by hinges and rubber rings. It has to be opened when the clock is winding (i.e. every 8 days) or when hands require setting.

Clock MK. II.

This clock is usually found on pilots instrument panel. It has one 8 day movement with keyed wind gear, a catch allows the key to be used for setting the hands. A pair of luminous hands are provided for marking start of flight.

Clock. III.

This clock has an eight day movement with a stop watch arranged. The two trip hands and second hand are started, stopped, and returned to zero by reversing spring of the knob situated four o'clock. The knob at six o'clock operates an arrested gear for interrupting the trip hands. A coloured tele-

shows red for recording and white for waiting, The knot at eight o'clock is for winding, and when pulled out for setting the hands.

Maintenance of clocks,

All clocks should be checked on the daily inspection and wound when necessary.

Fore and Aft Lines.

These instruments are of the liquid in glass type, and are used to indicate the attitude of the aircraft both longitudinally and laterally, The liquid must register at zero when the aircraft is in rigging position.

Maintenance

Check daily for security, cracked or broken glasses or tubes

~~Maintenance~~

~~Check daily~~

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Compasses.

Note the following.

1) Pendulous suspension to overcome dip.
2) The magnetic system is immersed in liqui to slow down oscillation and to reduce on the pivots.
3. The bowl is filled completely to exclu liquid swirl.
4. A capsule or sylfon bellows is inclu to allow for temperature changes.
5. The liquid is de-aerated to prevent t formation of bubbles at high attitud

Corrections.

1. Coefficient "B" + "C" are corrected by the corre Mag.
2. Coefficient "A" is corrected by rotating th mounting, any remaining error is put on deviation card.

Pilots Types.

"P" Types are used by the pilot to ma a course. They are fitted with a grid ring which rotates on the compass nt can also be locked in any position

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"P. 4. Standard type & magnets & filments - capsule.
" P. 6. Similar to P. 4. but smaller 2 magnets & filements nylon bellows.
" P. 8. Slightly smaller than "P. 6 moulded grid ring 2 magnets & filements
" P. 7. Designed to eliminate parallax error, compass is viewed in an adjustable mirror, through the glass topped nylon bellows, Grid glass is opal and has a scale on it under side. Subsidiary scale on grid ring edge. 2 magnets & filements.
" P. 9. Compass mounted upside down and viewed in adjustable mirror 2 magnets & filements.

Observers Type.

O, Types are used for taking bearings on distant e.g. of the sun, The compass card is mounted on the magnetic system and is read through the prism carried on an azimuth circle which can rotated
O, 2. & O 2A. Standard type, capsule & magnets & filements fitted in O5 standard O5 standards are fitted wherever required and each standard has a corrector key.

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96 Hand held compass, no correction for bulb and batteries in wooden handle

96A. Similar to 96 but with different finished i.e. moulded handle.

Azimuth Bracket.

Type 4 for use with 05H standard compass it can be put in any position it is fitted with dark glasses and a mirror for solar observations,

Bombright Compass.

When not in course setting bombright is has a wind direction arrow on the merge glass

Maintenance.

D.I.P. types — Check security of mounting connector box, Clean glass check action gridning, See that there are no bubbles

O Types — Check security of 05 standard clean glass on azimuth circle with clamp heather, Check action of azimuth, Replace equipment in storage

20 hr. — Examine Bezinid for discolouration Check anti-vibration mountings

30th hr – Pivot friction test, with a magents displace compass through 10°E hold for 2 min then release and note the setting position repeat 10°W. The differences between the readings should not be more than two degrees.

The bourne: Setting bombsight.

Instructions for removing from box.

Pull back the spring loaded knob and the bottom sight rear of the B/S. and pull sight of spigot.

To Replace in Box.

1. Set wind speed to zero.
2. Set enemy speed to zero, and enemy direction to 90°.
3. Set air speed to maximum
4. Set terminal velocity to ∞ (infinity)
5. Set sight bar shutter to 3,500 ft.
6. " centrifugal drift bar to position for
7. Lower wind gauge bar to (Port drift operational drift.
8. Release sight bar clamp. and lower sight bar.
9. Slide Bombsight on spigot, taking care not to strain the sight, until the spring.

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catal goes home.

Installation of Levelling Bracket.

1. Put A/C. into flying position and [illegible] bracket nuts in place
2. Place B/S. on bracket, and level B/S
3. Put wind speed and enemy speed [illegible] zero,
4. Drop plumb-lines from nose and tail of A/C and draw a line on ground through fore-aft positions and extend forward of the A/C.
5. Look through the sight at f/aft line it should lie parallel to thrift wire If not adjust the leveling bracket by puting thin washers under the forward securing bolt or the two rearward bolts until correct alignment is obtained.

Azimuth Bracket and steering Indicator.

This installation is intended to cut down the time needed for a bombing run. The azimuth bracket has a spigot which can be moved horizontally or locked in the true athwartships position, Movement

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of the spigot is repeated by the pointer of the pilots indicator, two small lamps, red and green, included in the steering indicator can be operated by the bomb-aimer by two push buttons, General maintence is to ensure freedom of the moving parts, greasing when necessary, to ensure that catch functions correctly, and that electrical system is operating.

Installation.

The spigot is locked in the ~~centre~~ central position and the installation is then carried out exactly as for the Levelling bracket, Steering indicator goes in the pilots panel, The main switch and press buttons go in the bomb-aimers position, If there is a 24V. supply three resistances must be used in the circuit,

Tail. Drift. Sight.

1. Measures angle of drift.
2. Base plate fitted in floor of A/C.
3. Telescope points downwards.

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Installation.

1. Put a/c in flying position, and level the base plate with washers under the bolt
2. Fit the telescope and turn pointer to zero
3. Draw f/aft line on larger floor.
4. Veiw the line through the telescope whi rotating the knob, The lines should rem in the gratiule
5. If not slacken the bolts and rotate the base plate slightly.

Maintenance.

1. Clean optical parts.
2. Clean base plate scale and slider and grease with anti-freezing grease if necessary.
3. Check the lighting system.

Drift Recorder.

To indicate to navigator the angle of drift of the a/c, and is installed the side of the a/c.

Installation

1. Slide drift recorder on the rails.
2. Drop plumb lines from nose and tail

of c/c. and draw f/aft line on larger floors

3. With someones help mark spot on ground coincident with nearest datums on graticule lense.

4. Draw a line to f/aft line, the angle between the two being 90°.

5. Looking through the eye piece this line should cut through both top and bottom datums on graticule lense.

6. If not rotate lense until the line is parellel to the datums.

7. Unscrew 1 screws securing drift scale, slide drift scale along until zero is coincident with bubble line.

8. Secure drift scale.

Maintenance,

1. Examine sorbo rubber for deteriation
2. Clean lense with soft cloth, taking care not to damage the pantagraph pointer.
3. Lightly oil all moving parts with anti-freezing grease.
4. See that pencil is in serviceable condition
5. Clean front glass with damp rag.
6. When not in use replace D/R. in its stowage

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Distant Reading Compass. (D.R.C.)

Has the advantages of overcoming the errors that effects a normal compass, and consists of the following:-

1. Master Unit.

Which is electrically operated gyro. controlled by a magnet, The M.U. sends electrical impluses to the:-

2. Variation Setting Correctors.

This enables the pilot and the Navigator to set the local variation on the repeators, thus making them read true geographical north. Electrical impulses from the V.S.C. go to the

3. Repeaters.

They are installed in various parts of the A/C in any convinient position, 6 repeaters can be used with one:-

4 Normal Setting Switch.

To Start M.U. and to speed up correction of the gyro on starting.

5. Radio Interference Suppressor.

To prevent the M.W words distorting the A/C radio

Before Flight Test. D.I.

1. Set switches to on and setting respectively after 5 mins or when the M.W. hunts about a constant heading switch to normal.
2. Set V.S.C. to zero.
3. Check that all repeaters read same as M.W + 1° error card.
4. Check hunting of M.W, put setting switch to setting. tilt M.W in easterly direction (reading will increase) Westerly direction reading will decrease.
5. Put switch back to normal.
6. Set local variation on V.S.C. if true reading is required

Synchronizing Repeaters.

1. Start D.R.C. and allow to settle
2. Set lubber line to its central position
3. Set V.S.C. dial to zero.
4. With key set all repeaters to same reading as near as possible to M.W reading + 1° error. Found one card on master Unit.
5. Adjust V.S.C. to eliminate any remaining errors.

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6. Set bubble line on V.S.C. to zero and lock.

Functioning Test.

1 Start D.R.C.

2. Note that at normal the hunt is $\frac{1}{8} + \frac{1}{4}°$ and at setting there is a slow oscillation over a range of 3.8 degrees.

3. Switch to normal and note M.W. reading per tilt M.W. in an easterly direction and hold it la until the reading increases by 5°. Return M.W. c=½R to vertical after two minutes take reading:- Repeat in a westerly direction, ~~(with readings)~~ difference between the two readings should not be more than 10°.

4. Note M.W. reading and switch to setting, Hold M.W. in easterly direction until the readings increase by 40° Switch to normal and return M.W. to vertical keeping it swinging at an amplitude of 3° until the repeaters return to there previous readings.

Note:- That at all times the repeaters are within ½° of M.W. take the time of ~~(degrees)~~ decrease in reading of 40°.

5/

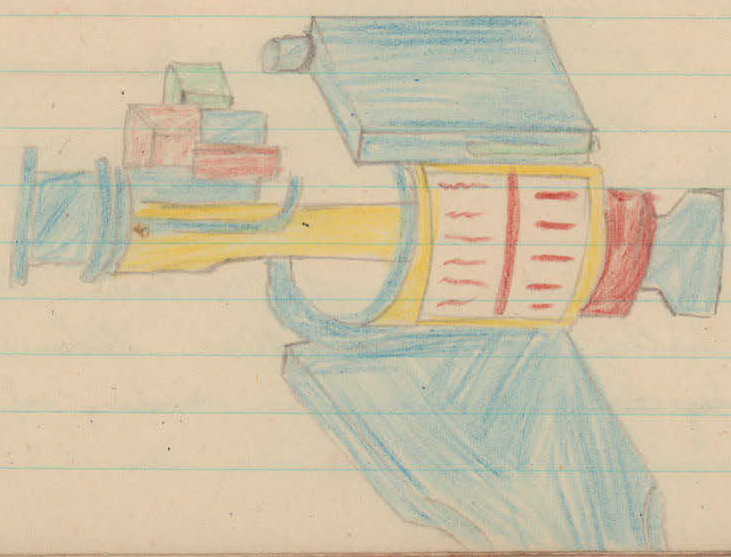
Repeat that in westerly direction

6/ Times taken in above should not be more than 7 mins and should not differ by more than 3 mins

7/ Check V.S.C. is at zero and note repeater readings. Set V.S.C. to 10° East and note that repeaters increase decrease by 9°-11°. Set V.S.C. to 10° West and note that repeaters decrease by 9° 11°

8/ Repeat the above settings and this time restrain the pointer from turning with the card

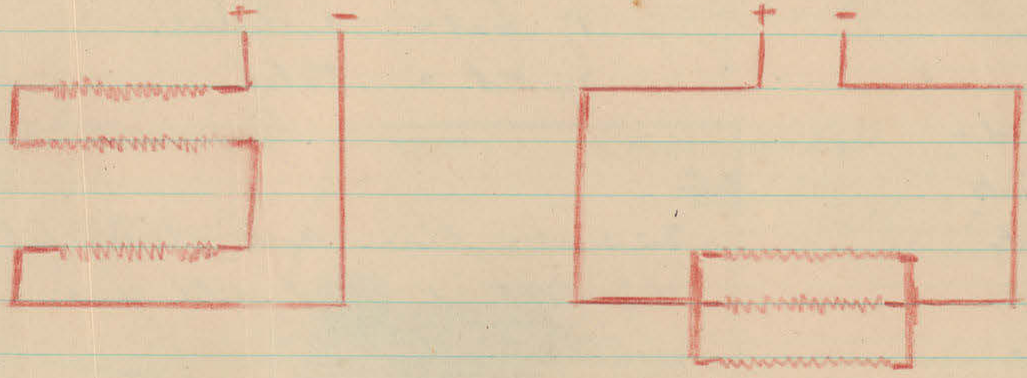
Electrical Engine Speed Indicator Generator MK. II. (EESI)



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Note.

In any piece of electrical apparatus the important thing is the amount of current (amps) there will be a certain figure for which the apparatus will be most efficient. The amount of current (amps) depends on (Voltage) (V) and the resistance (ohms) The bigger the voltage the bigger the current the bigger the resistance the smaller the current amps = volts ÷ ohms or $C = \frac{V}{R}$



Series.

Resistances can be connected together in two ways in series or parallel. (see sketch) when joined in series, the total resistance = the seperate resistances added together, In a parallel connection the total resistance

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turned upside down = each of the separate resistances turned up side down and added together

Note:

In a parallel circuit the total resistance is smaller than the smallest resistance used.

Cables.

1 Uni.
2. Du.
3 Tri.
4 quadro.
5. quinto
6 sexto
7 septo.
8 nono.

1) Cel = cellulose.
2). Met = Metal

Note.

Tri = cel = three leads cellular finish
Uni = Met 1 lead metal finish.

Continuity Tester.

Used for checking whether a lead is continuous.

Method of testing a Break.

Disconnect a section of lead from its terminal block

2/ Twist two loose end together at one end.
3/ Connect the continuity tester to the other end of the corresponding leads.
4. Press. button, if lamp lights the leads are OK.

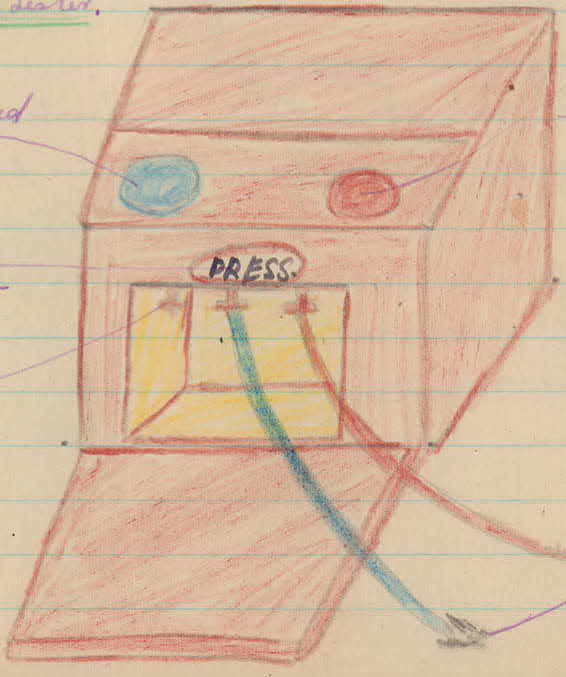
Warning.

Do not expect the tester to tell you anything about the continuity of instrument

Note.

Before using the tester, remember to check it.

Continuity Tester.



Light

Not Used

Battery at rear.

Push Button.

Not Used.

Quick attachments

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1 Megohm. = 1 Million Ohms.

Use Meggar.

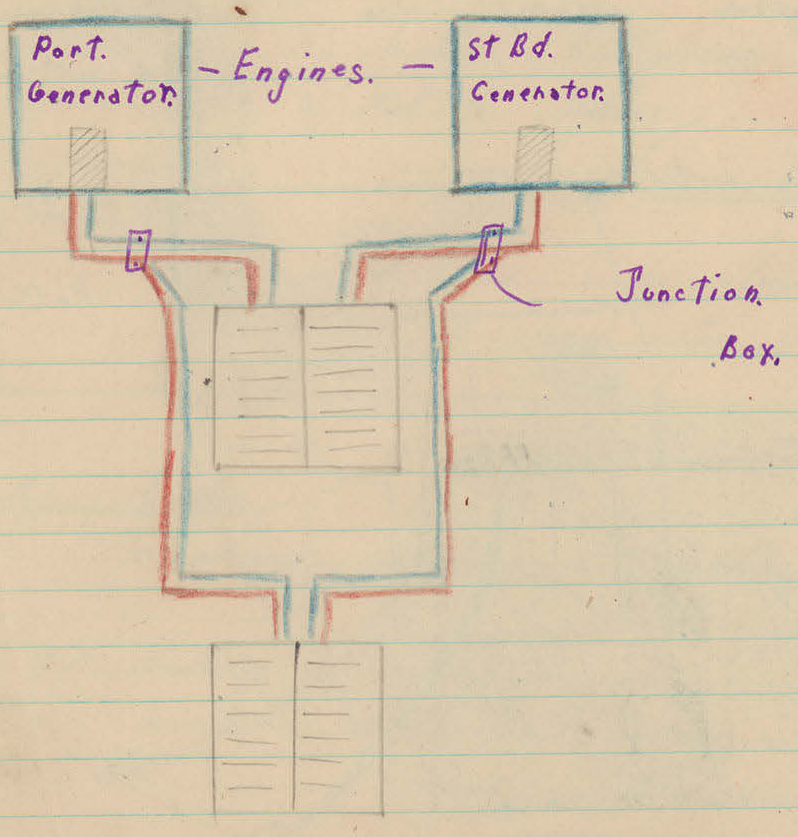
1 Used for testing insulation

2. Method of use see diagram.

Warning:- Dont use as continuity tester.

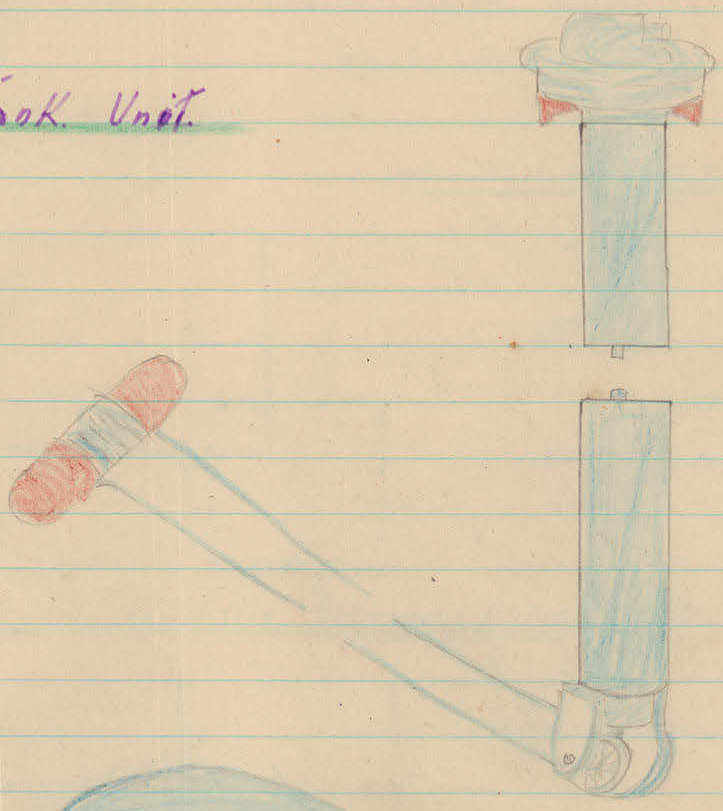
Never join both terminals of an instrument to a live meggar.

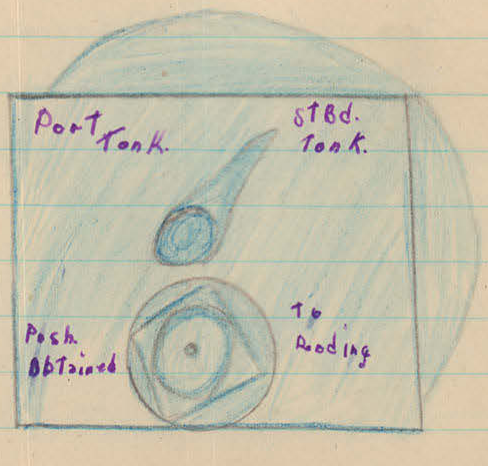
D.C. Control.



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Tank. Unit.





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Bridge Megger.

Three pointers

1. Meg:- Used as wee Megger i.e. to test insulation
2. Bridge:- To measure resistance
3. Vanley:- Not required in the service.

When using as a Megger.

1. Selector switch at "Meg."
2. Connections at "Loop" Terminals.
3. Turn handle - readings as in notes on the Megger

When Used as a Bridge.

1. Selector switch at Bridge
2. Connections at "Loop."
3. Ratio switch at ×1.
4. All resistance switches at 0.
5. Turn handle
6. Adjust resistance switches till pointer exactly at infinity

A. Method of Adjusting the Resistance Switches

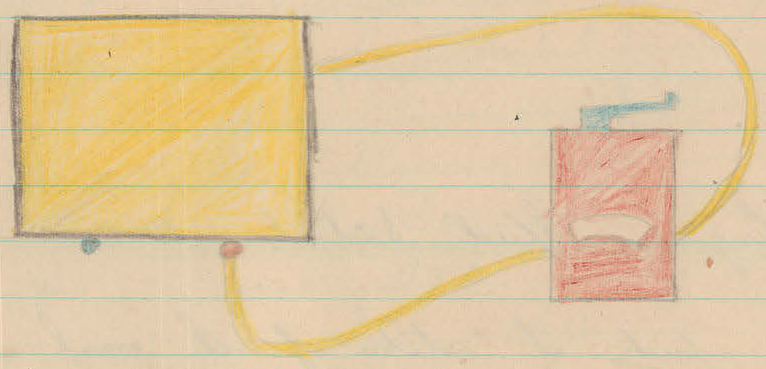
1. Put switch to 9,000 if too big try 900 if too big try 90 if too big try 9. etc.
2. Now get the reading as near as possible
3. If reading is less than 1,000 turn ratio switch to (÷ 100)

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4. If reading is less than 100 turn ratio switch to (÷ 10).

5. Now get the reading as near as possible and divide the result by 100 or by 10 as indicated by the ratio switch.

6. For resistance larger than 9,999 turn ratio switch to (x 10) (or x 100).

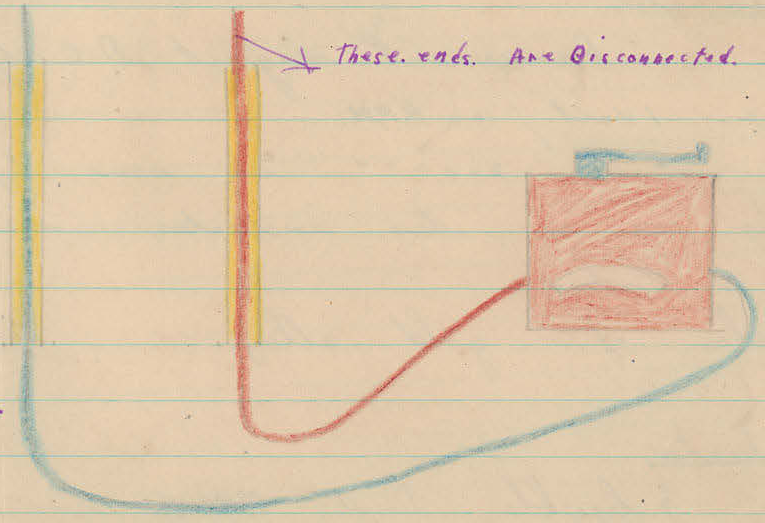


Earthing Test.
(Instrument.)

Test. For Insulation Between Wires.

Zero Reading –
No good.
Infinity Reading –
Insulation Perfect.

Any Reading above
2 Megohms
Satisfactory



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Earthing Test.
(Cables)



Electrical. Engine Speed. Indicator MK. II.

Indicates speed of rotation of the crank shaft

Generator.

Permanent magnet D.C. type.

Voltage. 1 Volt. / 100 R.P.M.

" " " 200 " " " in some types.

Operates one or two indicators, mile/ wheel

one or two

Brushes of gold alloy.

Indicator

Flexible Drive MK. VII.

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Epoxy Synopsis

1 What type of oil to use.
2 How to adjust pressure.
3 What to do if vacuum is low.
4 When must a drain trap be fitted.
5 How and when to clean oil filter.
6 Where are air filters.
7 What is procedure if an oil gland leaks.
8 ~~Where~~ Purpose of follow up indicator.
9 Where are they.
10 How to test and remove air from servo motor.
11 How to test over ride valves.
12 " " assemble B.C.V.
13 " " centralize B.C.V.
14 " " fit follow up cables.
15 " " check after fitting.
16 " " engage gyrofloat.