J. INWARD

FORM

Royal Air Force.

NOTE BOOK

FOR

Workshop & Laboratory Records.

PRELIM: RIGGING

T. 6239. Wt. 9057. 60,000 Bks. 3/36. W. & S. (211227T).

J. Inward N°569858.
"B" Squadron,
3 Wing.

INDEX

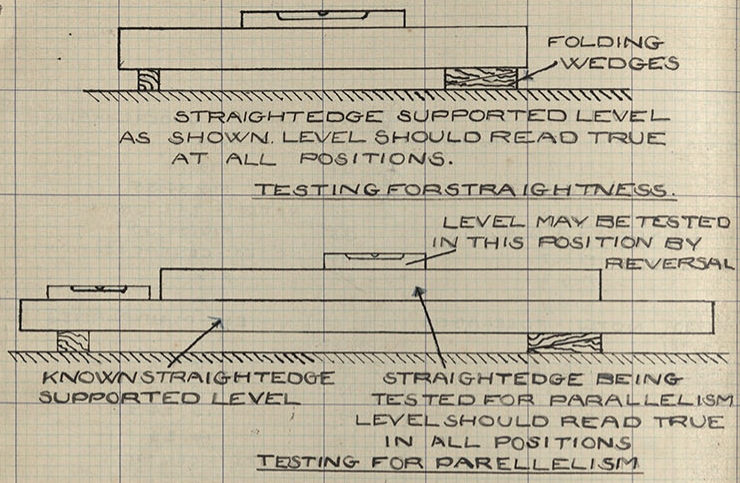


FIG. 1

CHECK ON STRAIGHTEDGES.

Handling of Erected Aircraft. Correct places to lift

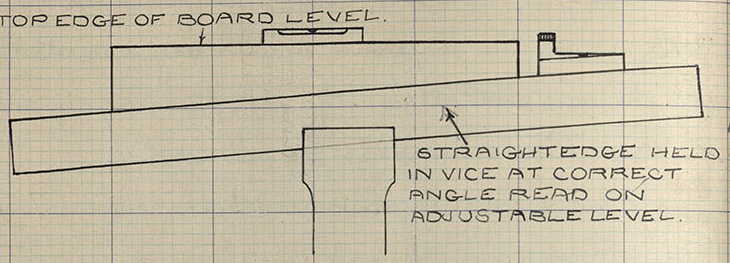
Tail. Under the longerons, beneath any side struts, at the rear end. Under the tail skid, or at any position where handles are provided.

Main Planes. Under the spars beneath the interplane struts

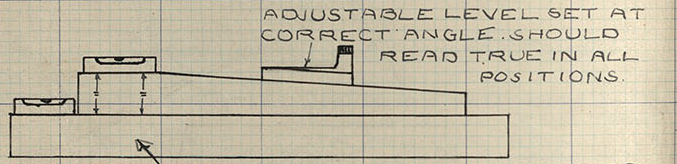
Undercarriage. Under the axle, as close as possible to the struts or oleo legs.

Moving an Aeroplane. If an aeroplane is jacked up inspect the ½ bearings, wheels, tyres, etc. Before lowering If the tail is to be lowered see that there are no obstructions under the tail or mainplanes. Every precaution must be taken to prevent damage to wing tips, and tail unit etc. The correct places at which to push or pull are at the top of the ½ legs or struts, at the bottom of the interplane struts and at the wing skids.

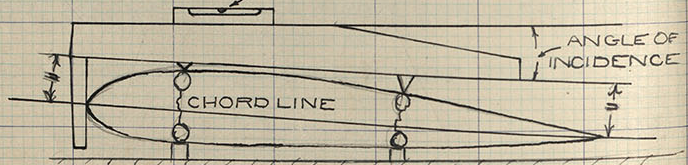
Supporting Fuselages. At the front under the jacking blocks, or under the longeron beneath a side strut. If an engine is fitted a weight should be attached to the rear end of the fuselage, but not suspended, to counteract the nose-heavy tendency.



CHECK ON DIHEDRAL BOARD.



CHECK ON INCEDENCE BOARD



MAIN PLANE OR MAINPLANE RIB SUPPORTED WITH CHORD LINE AT CORRECT ANGLE OF INCIDENCE TO HORIZONTAL (PREVIOUSLY SET WITH STRAIGHTEDGE AND PROTRACTOR) CHECK SHOULD BE MADE FROM BLUEPRINT IN ALL CASES WHEN PRINTS ARE AVAILABLE.

FIG 2. CHECK OF INCEDENCE GUAGE

Tools and Instruments. Refer. A.P. 1107 Paras 55-62 & 442-444.

Aircraft rigging involves use of:- ① Straight Edges to check relative alignement. ② Trammels to check, compare or mark-off distances. ③ Plumblines to indicate the vertical plane. ④ Levels to indicate the horizontal plane. ⑤ Protractors to check angular relationship.

Fixed-types, Angular, Incidence, and Dihedral boards. Adjustable Types, Stoney level, Clinometer, and adjustable level. The truth of these instruments must not be assumed without actual check.

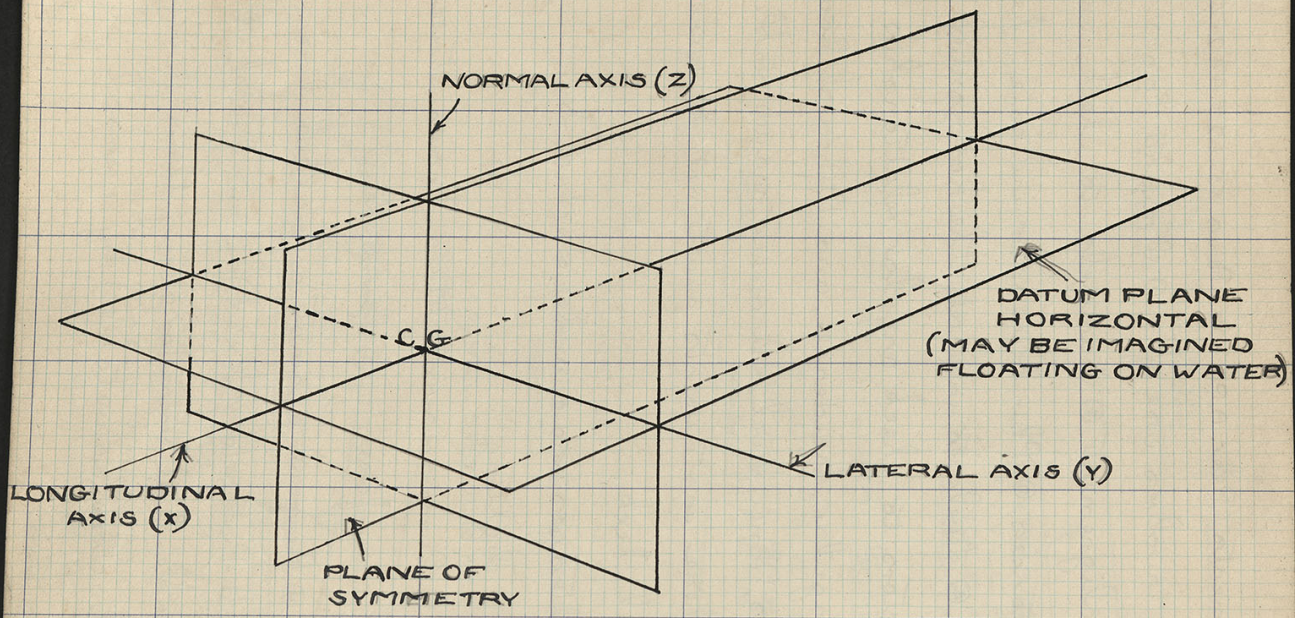
Checking. Straightedges and can be checked by

① Sighting

② Comparision with a known true surface. ③ Spirit Level.

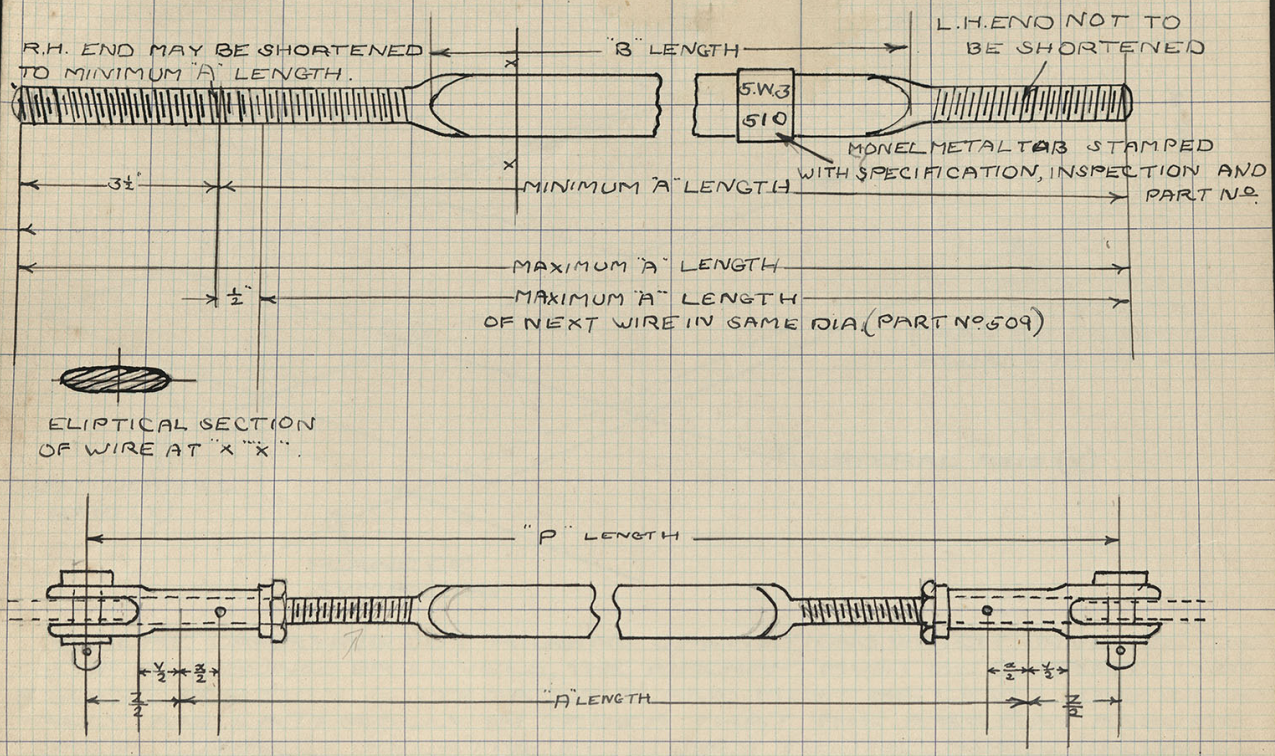
④ Reversal against a marked line.

Levels by reversal. Protractors (fixed) by spirit level. Straight edges and Adjustable Level protractor giving the angle or check by drawing. Protractors (adjustable) by reversal in the zero position.



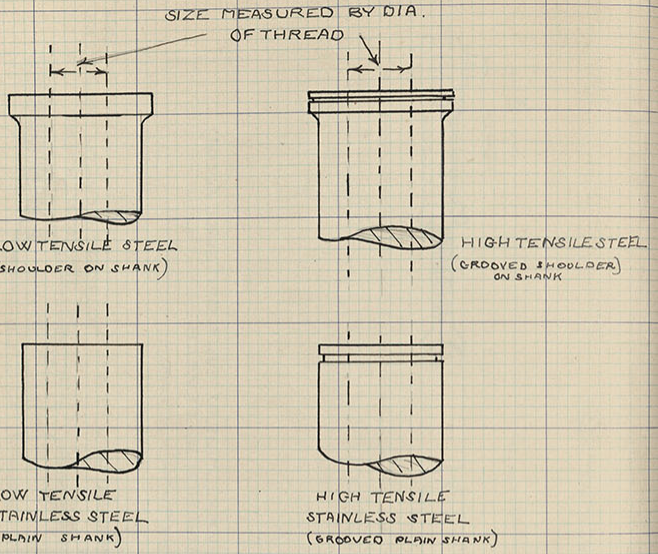
BEFORE CARRYING OUT RIGGING OPERATIONS WHICH INVOLVE THE USE OF PLUMBLINES OR LEVELS, THE AIRCRAFT MUST BE SUPPORTED IN RIGGING POSITION. i.e. ITS DATUM PLANE MUST BE LEVEL LONGITUDIN-ALLY AND LATERALLY IN ORDER THAT THE AXES MAY ASSUME THEIR CORRECT RELATIVE ATTITUDES TO THE HORIZONTALS.

FIG. 3 PLANES AND AXES.



STREAMLINE WIRE

FIG. 6.



FORK JOINTS.

(METHODS OF IDENTIFYING MATERIAL)

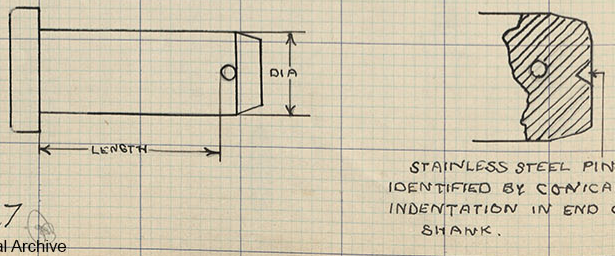
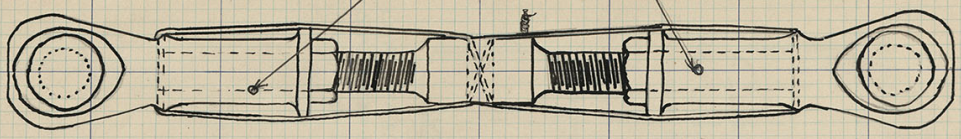


FIG.7

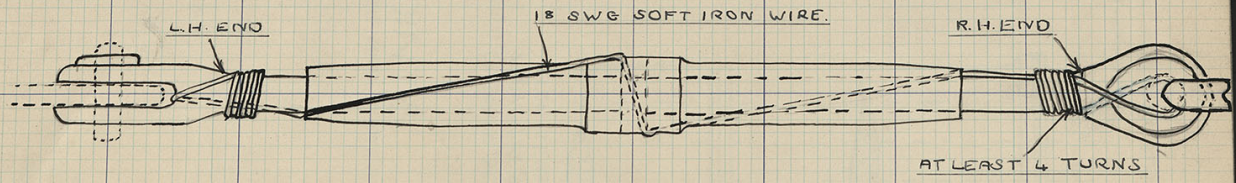


TENSION ROD TYPE TURNBUCKLE

SHOWING METHOD OF LOCKING FOR CONTROLS

SIZE BY DIA. OF THREAD

(AUTHORITY :- 464 VOL. II D.34)



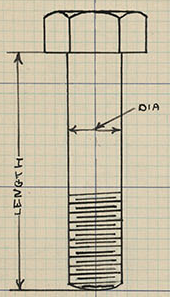
BARREL TYPE TURNBUCKLE

SHOWING METHOD OF LOCKING.

SIZE BY MINIMUM BREAKING LOAD OF CABLE WITH WHICH IT IS USED, STAMPED ON EYE END.

NOTE:- AS BARREL TYPE TURNBUCKLES BECOME UNSERVICABLE THEY ARE TO BE REPLACED BY TENSION ROD TYPE (AUTHORITY :- 1464 VOL. II D.11.)

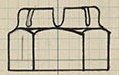
FIG. 8



PLAIN

M.S. BOLTS AND NUTS ARE IDENTIFIED BY A LETTER INDICATING DIAMETER.

M.S BOLTS ARE GIVEN A NUMBER WHICH IS TEN TIMES THE LENGTH.



CASTELLATED

ALL SIZES OVER $\frac{1}{4}$" DIA, ARE STAMPED, AND IN ADDITION, A L.H NUT IS STAMPED "L"

SLOTTED

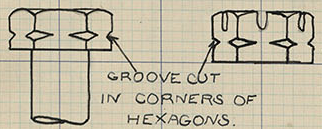
EXAMPLES

A $\frac{3}{8}$" B.S.F. BOLT 3" LONG IS STAMPED "J.30"

A $\frac{5}{16}$" B.S.F. L.H NUT IS STAMPED "G.L."

H.T. AND M.S. BOLTS AND NUTS ARE CADMIUM PLATED.

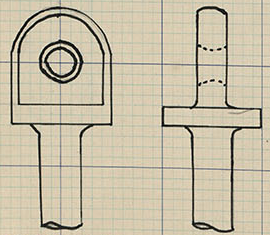
M.S. Bolts & Nuts.



H.T. NUTS MUST BE USED ON H.T. BOLTS AND EYE BOLTS.

STAINLESS STEEL BOLTS & NUTS ARE MARKED IN A SIMILAR MANNER, AND IN ADDITION STAMPED "S.S." ABOVE 2.B.A. ONLY

H.T. Bolts & Nuts.



M.S EYEBOLTS ARE IDENTIFIED BY A.C.S. No STAMPED ON

H.T.S EYEBOLTS ARE NOT A.C.S PARTS AND ARE IDENTIED BY MAKERS PART No STAMPED ON

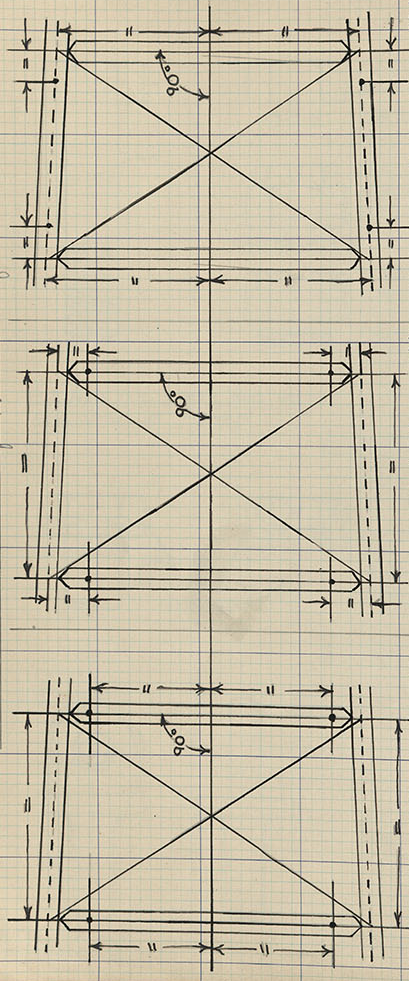
THEY ARE NOT GROOVED

(SEE 1462 VOL II B.19.)

FIG 9.

Eye Bolts.

Small circles indicate Points of Application of Tramel.



1/ Side struts checked for parallelism.
2/ Centre lines of struts marked near the strut ends.
3/ Equal distances marked off from mid-points of struts intersecting centre lines.
4/ Equal distances set off from ends of struts & joints of intersections along each strut.

FUSELAGE TRUING.

FIG.10.

METHODS OF MARKING OFF A SYMMETRICAL FIGURE TO BE TRAMELED AND CHECKING THAT SIDE STRUTS ARE AT R.T. ANGLES TO DATUM LINES.

Fuselages. Ref. A.P. 1107. Para. 213-226.

A fuselage is true:—

1/ When it is symmetrical about ℄ in plan.

2/ When the marked points on the side struts are in line with the Datum Line.

Truing consists of adjusting the bracings of the fuselage so that truth is obtained in three planes of reference. No hard and fast sequence can be laid down regarding the truing operation. Since there are so many variations in design, reference must be made to the type handbook.

Stem Frame. The stem frame should be checked to ensure that a) The stempost is vertical in end and side elevations.

b) The stempost is coincident with ℄ in plan.

c) The stempost is in the correct position relative to Datum Line

Engine Mounting. This must be checked to ensure correct relationship with F/U so that the airscrew thrust line will be:—

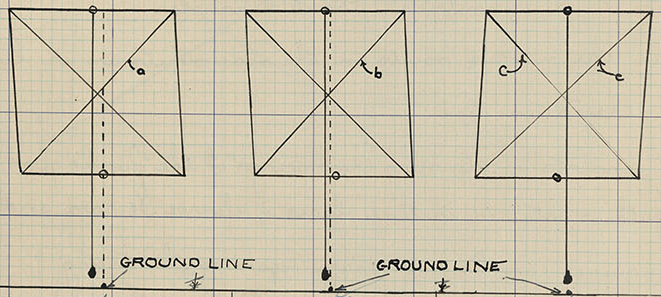
a) Parallel to and coincident with the ℄ in plan.

b) Parallel to and coincident with the Datum Line in side elevation and parallel to and at a given distance from the Datum Line.

P.T.O.

SMALL CIRCLE INDICATE POSITIONS OF MID-POINTS OF TRANSVERSE STRUTS.

DOTTED LINES INDICATE PLANE OF SYMMETRY REPRESENTED BY GROUND LINES.



CASE 1	CASE 2	CASE 3.
BOTTOM CROSS STRUT O.K. TOP CROSS STRUT OUT OF TRUTH WITH GROUND LINE. TENSION IN INTERNAL WIRE (a) EASED, AND TOP STRUT TRUED BY MEANS OF THE TOP PANEL BRACING WIRES.	TENSION IN INTERNAL WIRE(b) EASED TO ALLOW TOP AND BOTTOM CROSS STRUTS BEING TRUED IN RELATIONSHIP TO PLANE OF SYMMETRY BY MEANS OF TOP PANEL AND BOTTOM PANEL BRACING WIRES RESPECTIVELY.	TOP CROSS STRUT O.K. BOTTOM CROSS STRUT OUT OF TRUTH WITH GROUND LINE AND PLUMB LINE. TENSION IN INTERNAL WIRE (c) EASED AND BOTTOM STRUT TRUED BY MEANS OF BOTTOM PANEL BRACING WIRES.

TENSION IN INTERNAL WIRES SET TO SUIT ABOVE ADJUSTMENTS ON COMPLETION

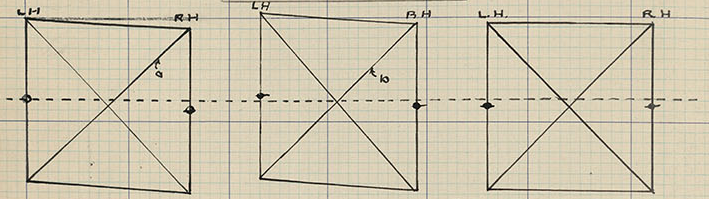
SIDE STRUTS IN ALIGNMENT WITH DATUM LINES

NOTES A TRANSVERSE PANEL MAY BE OUT OF TRUTH WITH COMBINED ERRORS IN RELATIONSHIP TO DATUM ~~LINES~~ PLANE AND PLANE OF SYMMENTRY.

FIG 11. ERRORS IN TRANSVERSE PANELS IN RELATIONSHIP TO PLANE OF SYMMETRY

The Engine Mounting must be free from twist in relationship to the fuselage in end elevation.

SMALL CIRCLES INDICATE POSITIONS OF MID-POINTS OF SIDE STRUTS.
DOTTED LINES INDICATE DATUMPLANE REPRESENTED BY DOTTED LINES.



CASE 1
L.H side strut O.K with datum line. Tension in internal wire (a) eased and R.H side strut true to datum line by means of R.H side bracing wires.

CASE 2
Tension in internal wire (b) to allow side struts being trued in relationship to datum lines by means of side bracing wires.

CASE 3.
Both side struts low in relationship to datum lines and raised by side wires. Internal wires in tension.

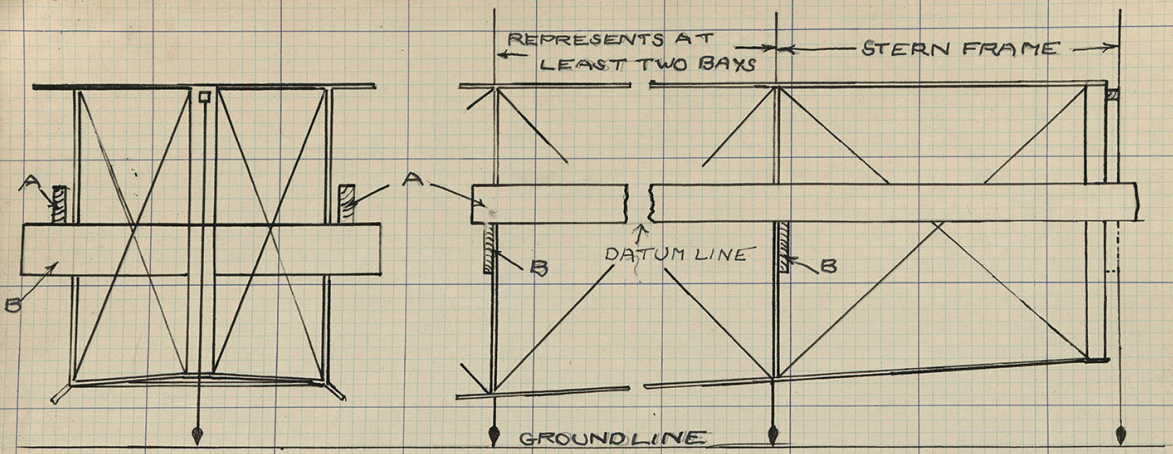
TENSION OF INTERNAL WIRES SET TO SUIT ADJUSTMENTS ON COMPLETION.

TRANSVERSE STRUTS IN ALLIGNMENT WITH PLANE OF SYMMETRY

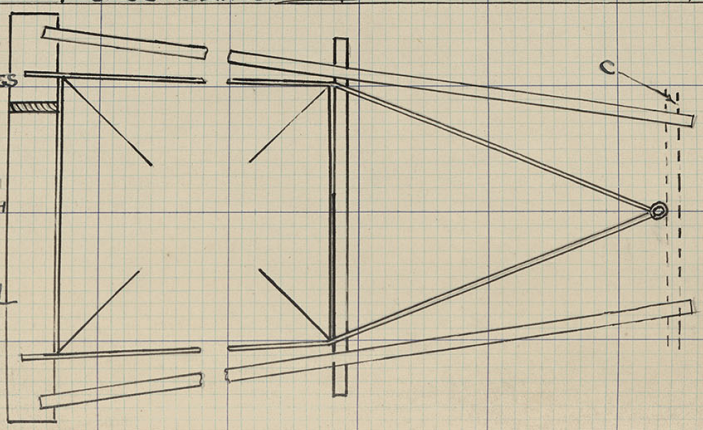
NOTE:- A TRANSVERSE PANEL MAY BE OUT OF TRUTH WITH COMBINED ERRORS IN RELATIONSHIP TO DATUM PLANE AND PLANE OF SYMMETRY.

ERRORS IN FUSELAGE, TRANSVERSE PANELS IN RELATIONSHIP TO DATUM PLANE

FIG 12.

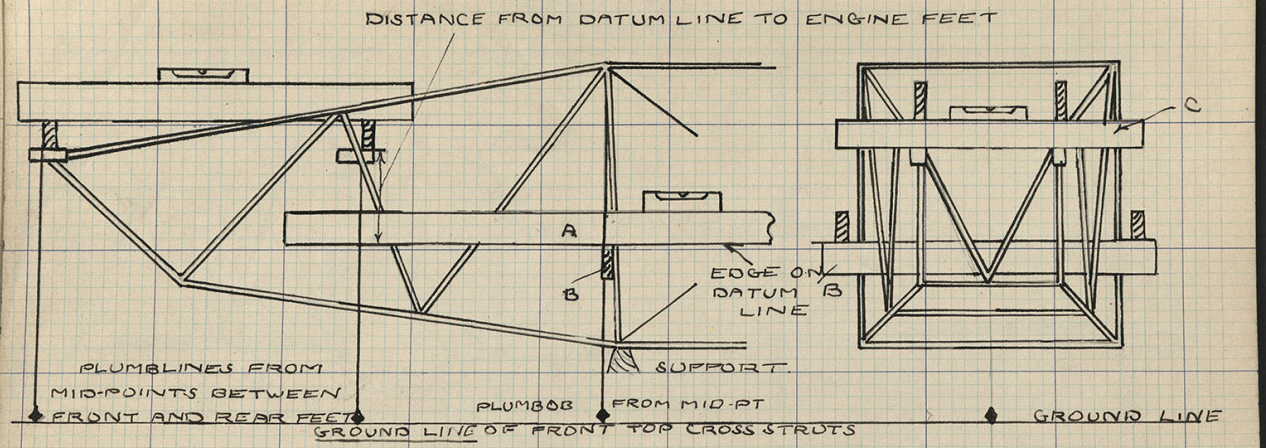


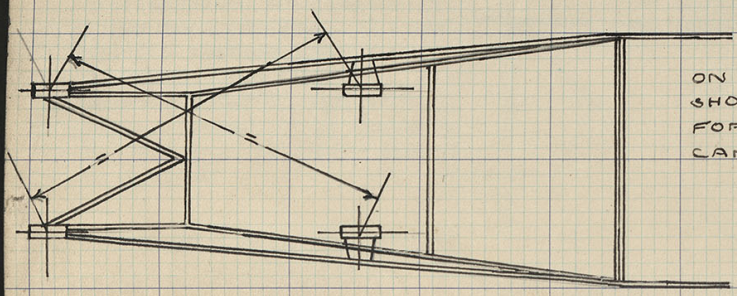
LONGITUDINAL ST. EDGES "A" RESTING ON LATERAL ST. EDGES "B," PROJECT DATUM LINE AFT PAST THE STERN POST. LOOSE ST. EDGE "C" USED TO CHECK ALIGNMENT OF DATUM MARK ON STERN POST WITH ST. EDGES "A."



CHECKS ON TYPICAL STERN POST.

FIG. 15

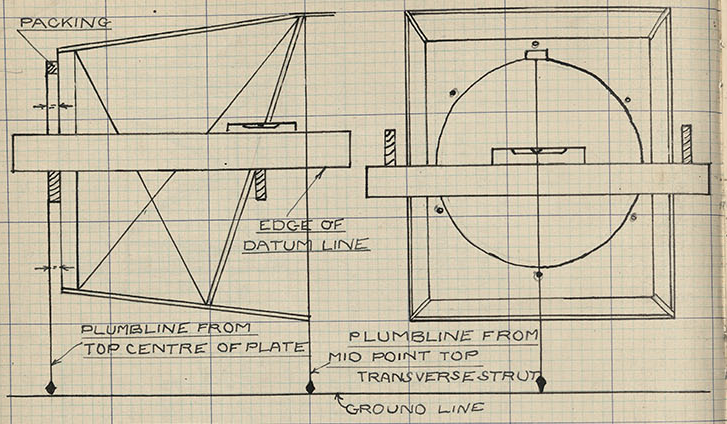




LONGITUDINAL ST. EDGES "A" REST ON TWO TRANSVERSE ST. EDGES "B" ONE SHOWN PROJECTING THE DATUM LINE FORWARD FROM WHICH HEIGHT CHECKS CAN BE TAKEN TO THE ENGINE FEET.

FIG. 13.

CHECK ON BEARER FOR IN-LINE ENGINE.



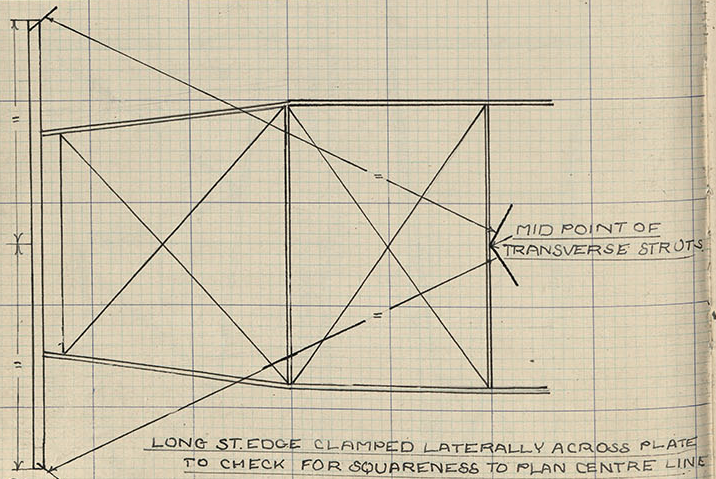


FIG 14 CHECKS ON BEARER FOR RADIAL ENGINE.

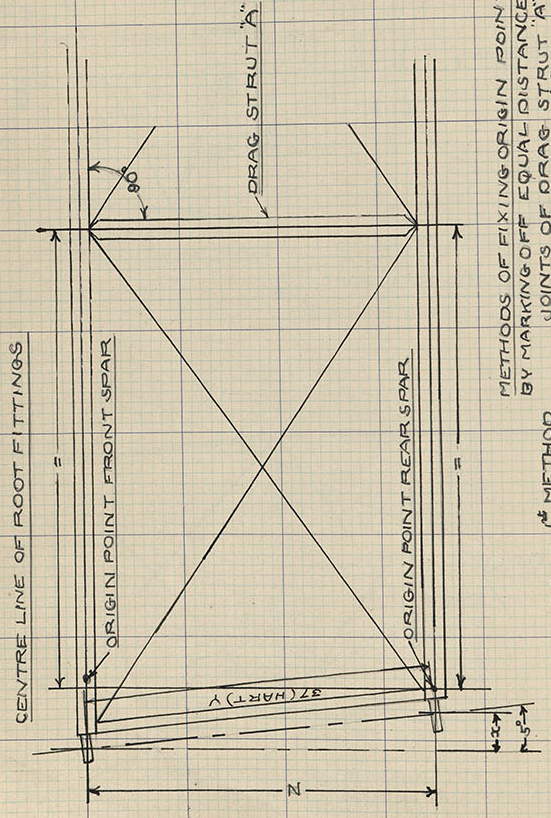


FIG.20. INTERNAL TRUING SWEPT-BACK MAIN PLANE.

Mainplane Truing Internally. REFER: AP. 1107 Paras. 234-243

The aim in truing mainplanes is to obtain conformity to drawing so that when erected on F/U or centre section the mainplane assumes its correct relationship to the ℄ of the F/U in plan. In most cases this condition is fulfilled when:—

1) Spars are out of winding. Check. straightedges and sighting. 2) Spars are correct distances apart (see diagram). Check. Trammelling spar centres. 3) Spars are straight. Check. Comparison with a stretched line or straightedges. 4) The ℄ through the spar root fittings correct in angular relationship to the spars. Check. By calculations and trammelling or by comparison with jig or template. Adjustments. The errors in 3 and 4 other than constructional ones are rectified by the adjusting of the cross-bracing.

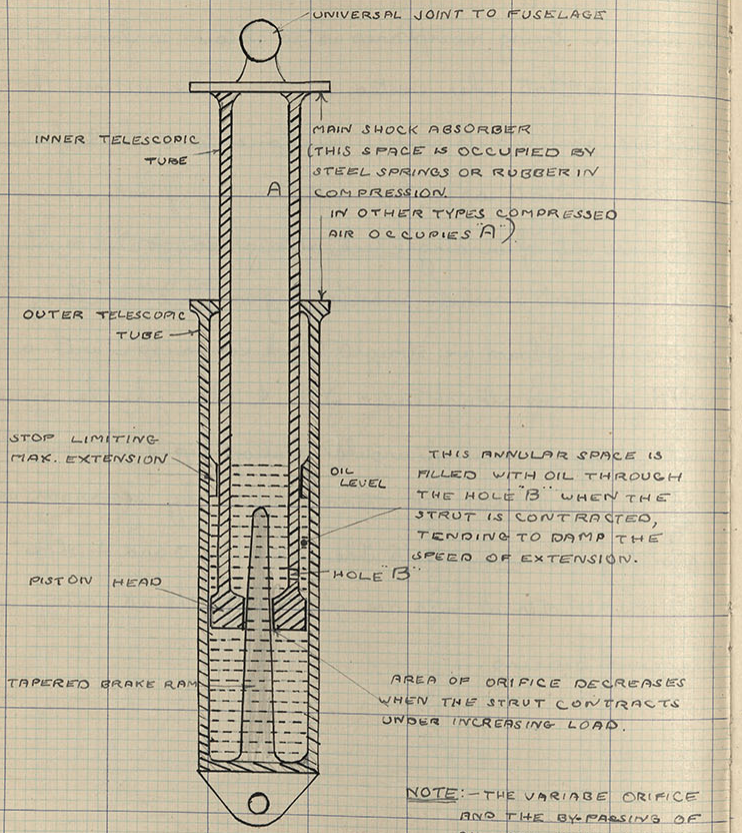


FIG 17 SECTIONAL DIAGRAM OF OLEO STRUT.

Undercarriges REFER A.P.1107 Para's. 156; 199-204; 244-249

General. There are three main types; ① through axle ② divided axle (also referred to as split axle). ③ Independent undercarriage units. The U/C is a structure usually incorporating wheels (or floats) and a device for absorbing landing shocks, upon which the aircraft can stand, and upon which it can land or take off. In most cases it gives ground clearance for the airscrew.

TRUING. Undercarriages are invariably trued to equally dispose them about the plane of symmetry of the aircraft. Adjustments are always made with the aeroplane jacked up, so that the weight is taken off the wheels, in this way errors due to unequal extension of the shock-absorber legs are obviated. Also danger of the U/C collapsing if any of the wires become accidently detatched. If through axle type of undercarriage is trued by

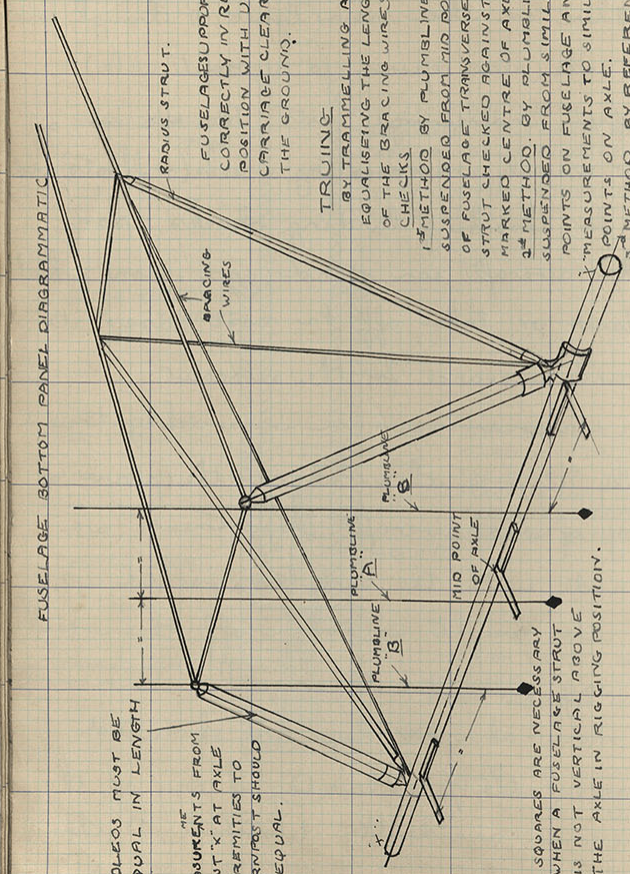


FIG 18

FUSELAGE SUPPORTED CORRECTLY IN RIGGING POSITION WITH UNDERCARRIAGE CLEAR OF THE GROUND.

TRUING BY TRAMMELLING AND EQUALISEING THE LENGTHS OF THE BRACING WIRES.

CHECKS.

1st METHOD BY PLUMBLINE "A" SUSPENDED FROM MID POINT OF FUSELAGE TRANSVERSE STRUT CHECKED AGAINST MARKED CENTRE OF AXLE.

2nd METHOD. BY PLUMBLINE "B" SUSPENDED FROM SIMILAR POINTS ON FUSELAGE AND MEASUREMENTS TO SIMILAR POINTS ON AXLE.

3rd METHOD BY REFERENCE TO A CENTRAL GROUND LINE. WHEN METHODS #1 AND 2 CANNOT BE APPLIED.

TRUING A TYPICAL UNDERCARRIAGE.

trammelling the cross bracing wires and adjusting until they are of equal length. NOTE. Before erection, dismantling or truing of U/C the aircraft should be firmly supported.

CHECKS. Aircraft must be in rigging position 1) Hang plumblines from convenient equivalent points on the F/U and measure to the centre of axle or to equivalent points at or rear axle ends. REFER AP 1107 FIG 76. 2) Compare distances from the axle extremities to some point on the C/L of the fuselage rear sternpost.

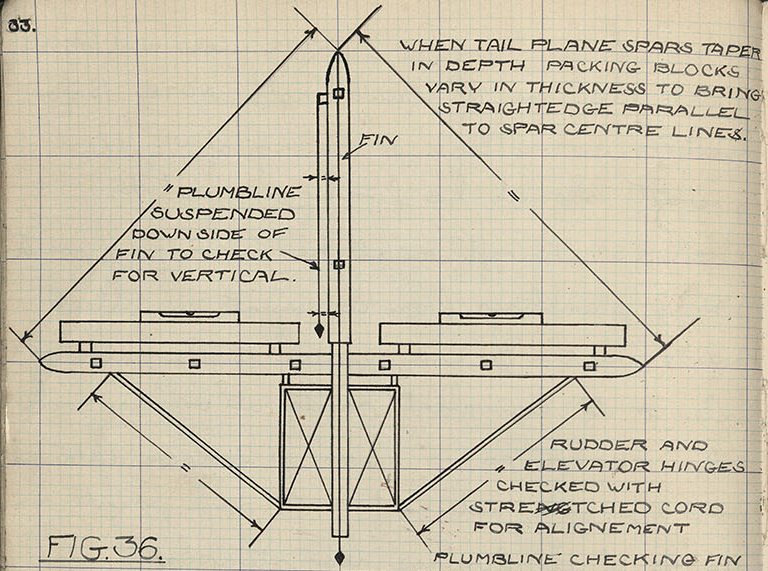


FIG.36.

CHECKS ON TAIL UNIT IN END ELEVATION.

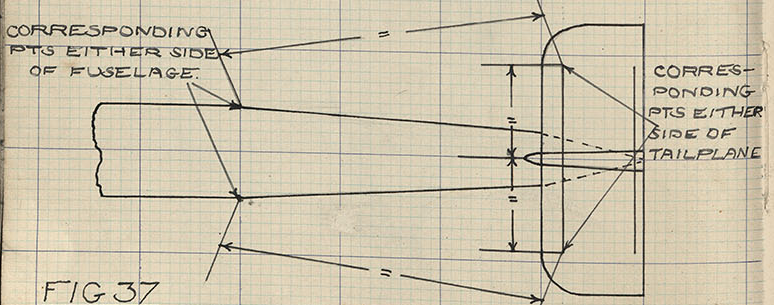


FIG 37

CHECK ON T/UNIT IN PLAN.

Erecting and Truing Tail Units. REFER. AP.1107 Pars. 277-280

Erection The method adopted for ~~truing~~ assembling tail units and the sequence of erection of the parts are described in the handbook for the type. Truing. The aim in truing a T/U is to ensure its correct relationship to the fuselage in 1) Side elevation 2) End Elevation. 3) Plan. 1) Truth in side elevation is governed by the tail adjusting gear. The following conditions are observed prior to the erecting of the tail unit. a) The adjusting gear at a defined normal setting. With the wheel or the control lever in the cockpit at normal. b) Full travel and free movement of the tail adjusting gear. c) Correct relative movement of the wheel or the control lever and the screw jack. After tail unit is assembled the range of T/P incidence from normal is checked 1) by straightedge, blocks and ~~spirit level~~ adjustable protractor. REFER. AP.1107 ~~Adjustment~~ FIG 80. 2) Truth in end elevation is obtained when :- a) Sternpost and/or finpost is vertical. Check by plumb line. Adjustment. None. Any errors disclosed

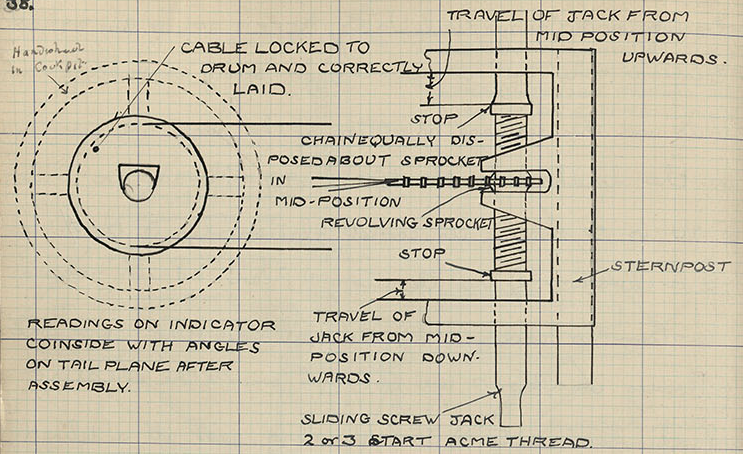


FIG. 34 DIAGRAM OF TAIL ADJUSTING GEAR.

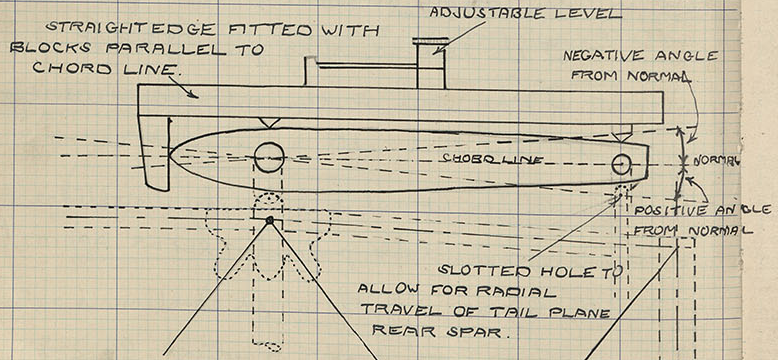
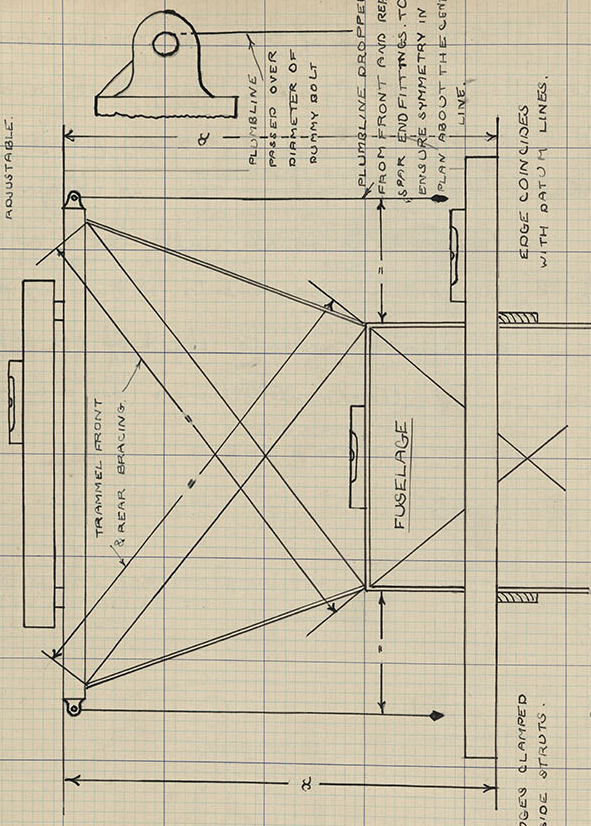


FIG. 35 CHECK ON TAIL PLANE IN SIDE ELEVATION.

indicate that F/U is out of truth. b) Tail plane spars are horizontal. Check. By straightedge, blocks and spirit level. Adjustment. By F/P bracing wires or adjustable stays. 3) Truth in plan is obtained when :- a) Tailplane is square with the ℄ of F/U Check. By diagonal measurements. b) Fin is parallel to or at a defined angle to the ℄ of F/U. Check By position of attachment fittings. (See drawing).



CHECKS ON CENTRE SECTION
FRONT ELEVATION

FIG. 21.

Locating and Truing Centre Sections. Ref. A.P. 1107 Pars. 251-265

The aim in truing a centre section is to ensure its correct relationship to the F/U in plan and end and side elevation. With the F/U in rigging position these conditions are fulfilled when the C/S is :-

1/ Correctly disposed about the plane of symmetry.

Check. For equal distances of plumb lines suspended from root fittings to approved points on the F/U.

Adjustments. On transverse bracings.

2/ Correctly disposed fore and aft (Correct stagger)

Check. For equal distances of plumb lines suspended from root fittings on leading edge to corresponding position on lower root fittings on approved points on the F/U.

Adjustments. On side bracing wires or struts.

3/ Correct angular relationship to Datum Line (Correct Incidence)

Check. Incidence board and spirit level on straight edge and adjustable protractor.

Adjustments. Alter length of side struts if

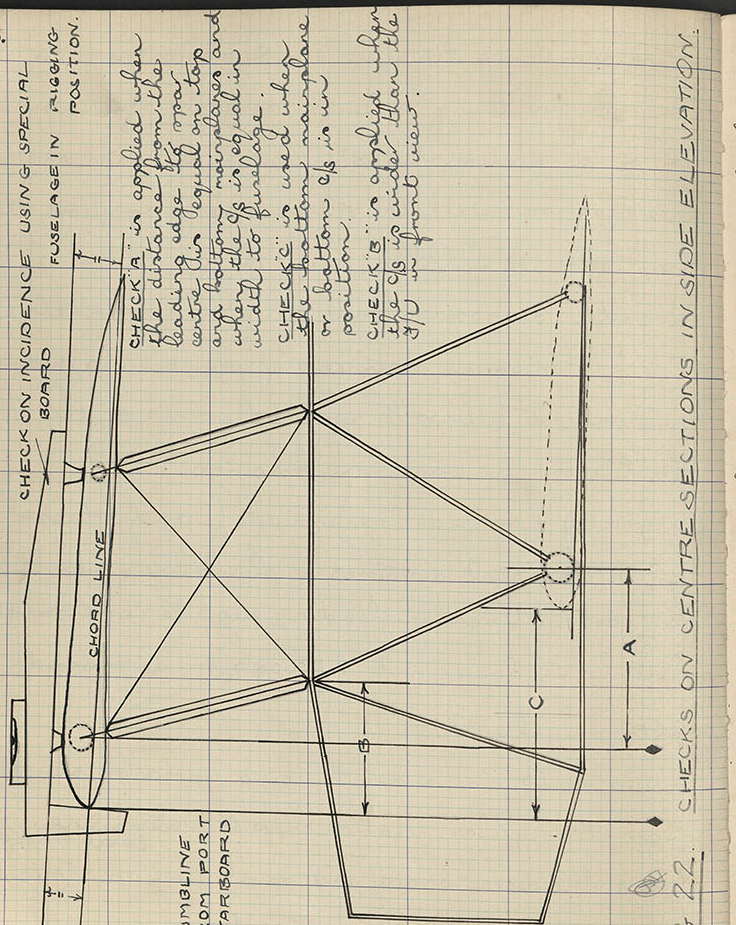


FIG 22. CHECKS ON CENTRE SECTIONS IN SIDE ELEVATION.

adjustable. Operations 1 & 2 should automatically ensure correct incidence. Consequently side struts are not made adjustable on all types.

4/ Transversly Level

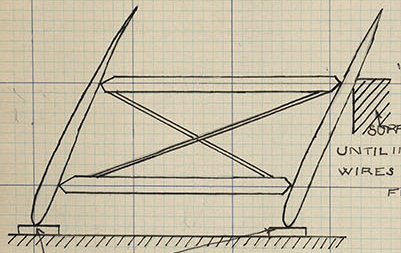
Check Straight edge and spirit level.

Adjustments Where side struts are adjustable corresponding side struts must be made to equal length.

5/ Correct Height above Datum Line (to avoid subsequent errors in dihedral)

Checks Measure distances from Datum Line and compare with rigging dimensions for the types.

Note This only applies to types with adjustable struts. The fact that many of these adjustments are interchangeable does not permit omission of checks 1-4.

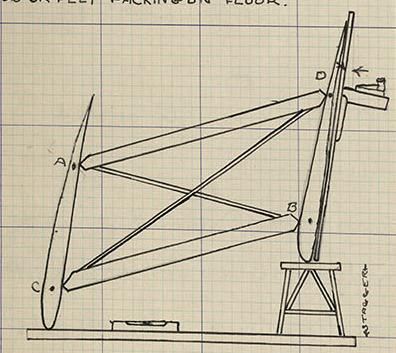


STAGE 1

1. Wires identified by part No. on tabs in conjuction with maps part schedule or by comparison for length and diameter or by being previously labelled.
2. Struts are generally pencilled.
3. Mainplanes supported on leading edges at approximate gap on soft packing.
4. Inner struts and Incidence wires fitted.
5. Outer landing and flying wires fitted.

STAGE 2

1. Box supported as shown and incidence to vertical adjusted by incidence wires.
2. Trailing edges of planes and interplane struts vetted for parallelism.
3. Dihedral may be tried if 'A' length of outer landing and flying wires are known.
4. As a further or alternative check when centre section is true. Pencilled distances A-B and C-D between spar centres must be equal on main planes to those on the aircraft, and are corrected by means of the incidence wires.



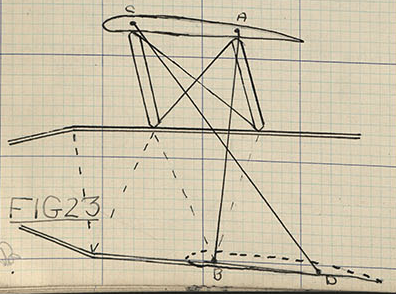


FIG 23.

BOXING-MAIN PLANES

Erecting and Truing Main Planes. REFER. A.P. Paras. 266-276.

Erection. The method employed is usually defined in the Handbook for the type. In some cases main planes are erected individually and in others are boxed before erection. The choice of method is governed by the nature of the attachments. Weight and size of M/Ps and the appliances available.

Truing. The aim when truing is to ensure correct relationship of the M/Ps to the fuselage in the following views :- 1) End elevation (dihedral).

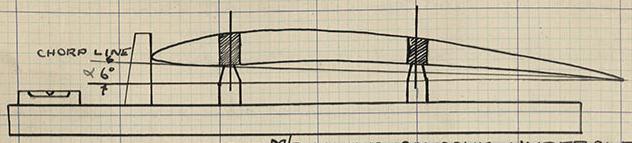
2) Side elevation (incidence and stagger).

3) Plan (symmetry).

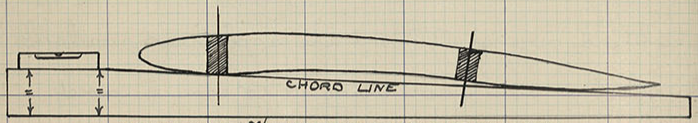
Interplane relationship is established by interplane strut lengths. Note. It is essential that the truth of the c/s be checked prior to mainplane erection.

1) Dihedral. Check with straightedge and protractor along the front spar, or with dihedral board and spirit level. Adjustments. On rear landing and flying wires.

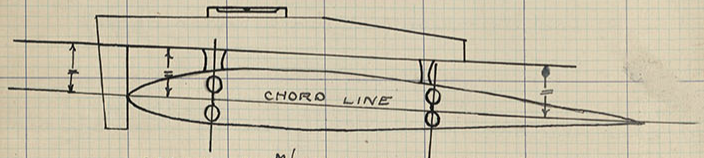
2) Incidence. Check with straightedge or protractor along or parallel to the chord of the plane or with



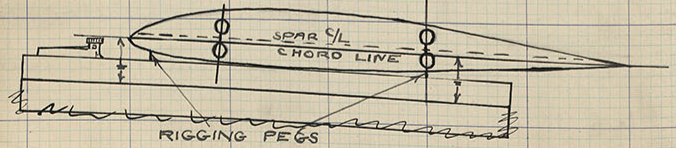
GAUGE FOR M/P HAVING CONCAVE UNDERSURFACE.



GAUGE FOR M/P HAVING R.A.F. 15. SECTION.



GAUGE FOR M/P HAVING BI-CONVEX SECTION



ST. EDGE AND PROTRACTOR WHERE ANGLE IS IN RELATIONSHIP TO SPAR ℄.

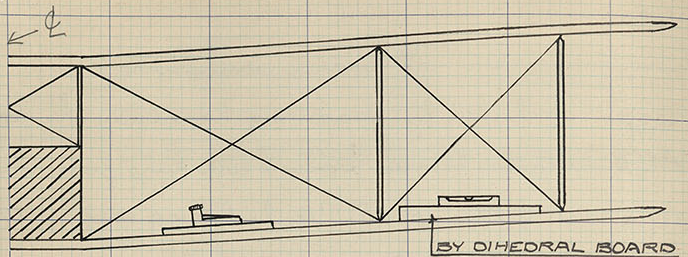
FIG 26 METHODS OF CHECKING ANGLE OF INCIDENCE.

incidence board and spirit level.

Adjustments On rear landing and flying wires.

1) Stagger is checked by measuring horizontally the fore and aft distance between a plumb line hung from the leading edge of the upper M/P to the leading edge of the lower M/P. Adjustments By means cross bracing wires between the front and rear interplane struts.

2) Symmetry Check. For equality of distance from corresponding struts joints on port and starboard M/P. to the stern post or other pre-determined accessible points in the vicinity, any errors must be traced by reckoning previous adjustment of components.



DIHEDRAL MAY BE CHECKED BY LENGTHS OF WIRES IF "P" LENGHS ARE KNOWN.

CHECK ON DIHEDRAL ANGLE

FIG. 24

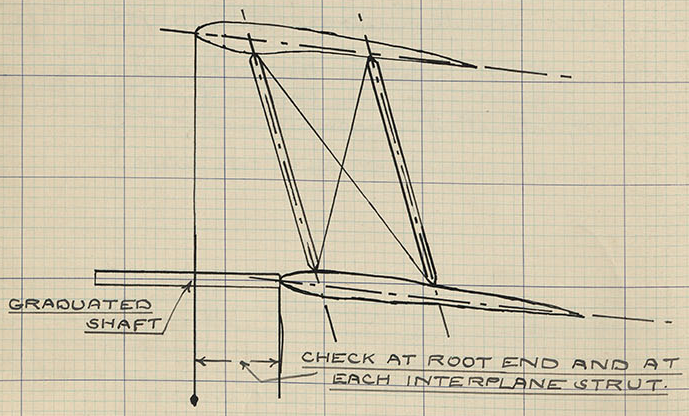
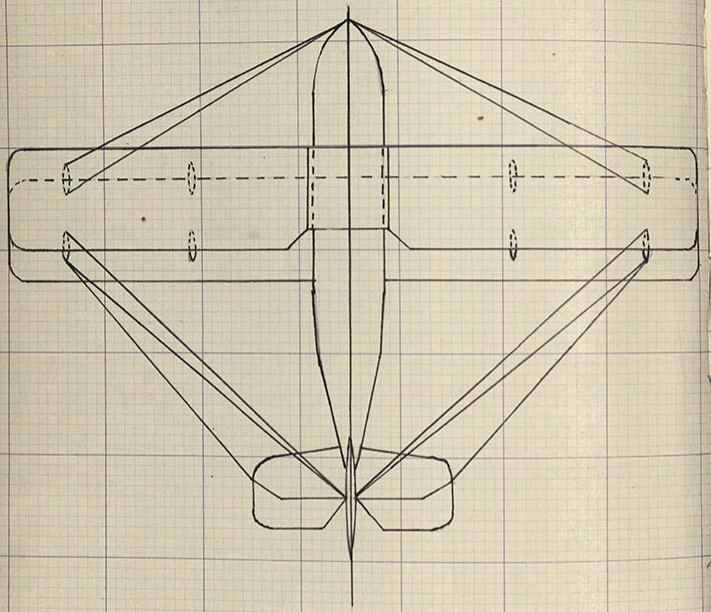


FIG. 25. CHECK ON STAGGER.

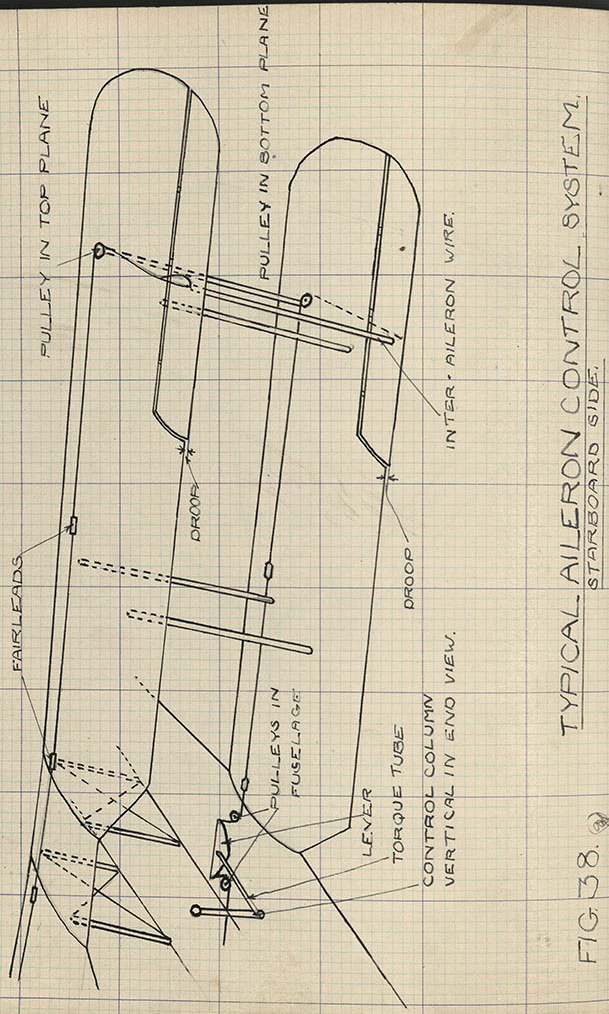


MAIN PLANES MUST BE DISPOSED SYMMETRICALLY ABOUT THE AIRCRAFT PLAN CENTRE LINE

CHECK USING STEEL TAPE FROM CENTRE POINTS (Centre of Airscrew Hub and Sternpost) TO OUTER INTERPLANE STRUTS.

CHECK ON MAINPLANE SYMMETRY

FIG. 28



TYPICAL AILERON CONTROL SYSTEM.
STARBOARD SIDE.

FIG 38.

Flying Controls REFER AP. 1107 Para's 283-298.

The controls of an aeroplane are arranged to be instinctive in operation. The controlling surfaces are placed as far away as possible from the c of G in order to provide sufficient leverage about the three axes. Control is provided in three directions:—

LATERALLY about the longitudinal axis — ailerons.
LONGITUDINALLY about the lateral axis — elevators.
DIRECTIONALLY about the normal axis — rudder.

The ailerons are operated by:—

1) Lateral movement of the control column.
2) A wheel attached to control column.

The elevators are operated by, fore and aft movement of the c/c

The rudder is operated by a rudder bar or pedals.

In order to improve the controls of an aeroplane various devices other than the normal flap type of control surface are

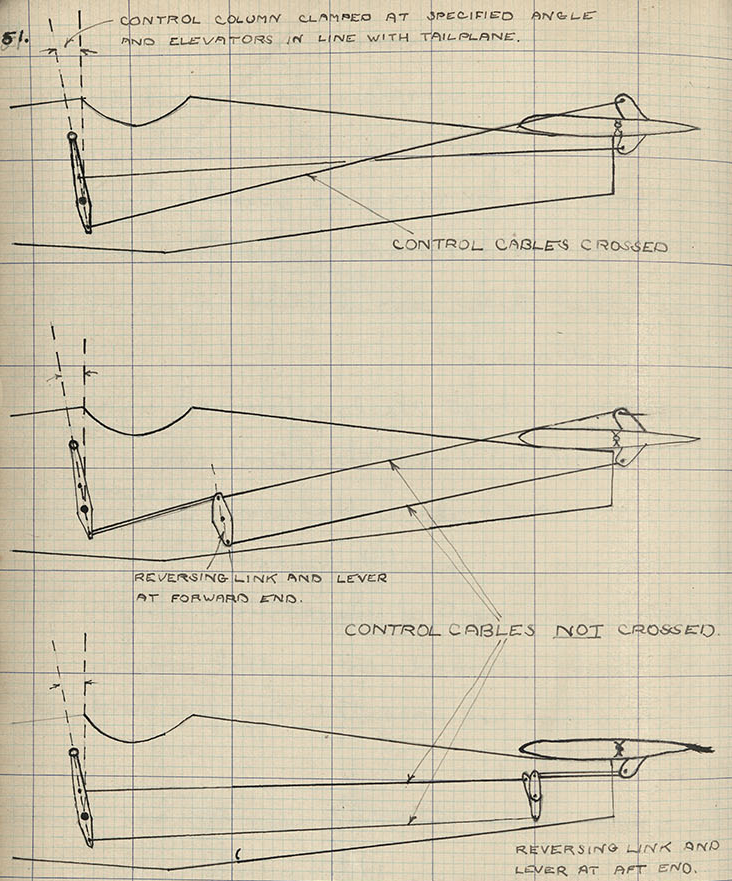


FIG 39. TYPICAL ELEVATOR CONTROL SYSTEM DIAGRAMS

fitted, their object being to lighten the controls and to effect better control near the stalling angle. The installation, truing and maintenance of controls is of the utmost importance.

CHECKS 1) Ensure the correct relative movement of controls surfaces. 2) Ensure that no part of the control system is fouling aircraft structure. 3) Ensure that all cables are at correct working tension. 4) Ensure that required sweep of each control surface is obtained from the normal position. 5) Ensure that all turnbuckles are in safety and that all pins etc are correctly locked.

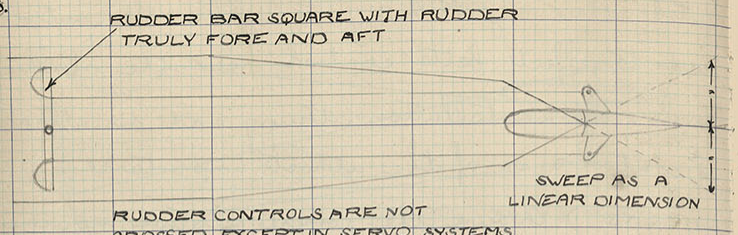


FIG.40 RUDDER CONTROL DIAGRAM.

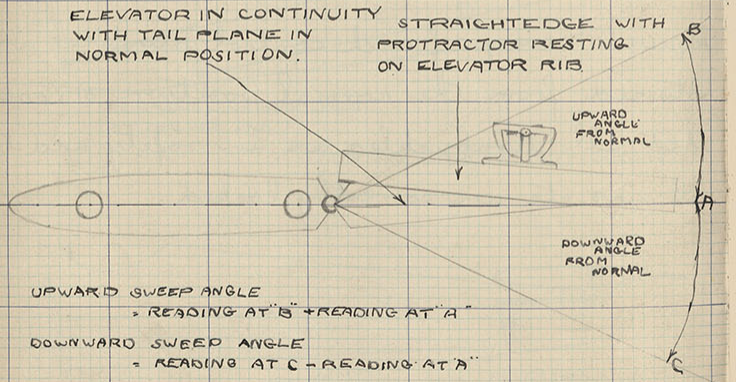


FIG41 MEASUREMENT OF SWEEP OF ELEVATORS. (WHEN A LINEAR DIMENSION IS SPECIFIED THE VERTICAL MOVEMENT OF THE TRAILING EDGE IN RELATION TO A FIXED VERTICAL POST IS MEASURED.)

DAILY

WEDNESDAY 20.1.37

Q1. How would an aeroplane be supported for truing?

Q2 How is a spirit level checked for truth?

THURSDAY. 21.1.37

Q3 What is meant by:- a) Riggers angle of incidence?

b) Lateral Dihedral Angle?

c) Stagger?

Q4 Define Rigging Position?

Q5 Why is it necessary to place an aeroplane in rigging position before making rigging checks or adjustments?

QUESTIONS.

A1 The weight of an aeroplane should be taken on special jacking blocks if fitted by makers, or on trestles placed respectively near the undercarriage struts and tail skid. The trestles must be placed underneath the junction of a vertical fuselage strut and longeron.

A2. By reversal on a known true edge.

A3. a) The angle the chord of a plane makes with the horizontal datum lines.

b) The angle made by the mainplanes to the lateral axis of the plane when the machine is in R/P.

c) The lead one plane is in advance of the other when the machine is in R/P

A4. Rigging position is the term applied when an aeroplane is laterally and longitudinally level

A5 Because the fuselage must be in its normal position before components can be checked for being in correct relationship to it. (i.e. the fuselage is

SATURDAY 25.1.37

Q6 Would it be safe to remove a front landing-wire without placing a trestle under the mainplane?

MONDAY 25.1.37

Q7 What types of thread are found on bolts used for aircraft construction?

Q8 How are the sizes of the following determined a) Shackle Pin? b) Split Pin? c) Fork Joint?

Q9 What is meant by the "A" length of streamline wire?

Q10 By what means are nuts locked when used on ~~aircraft~~ an airframe?

WEDNESDAY 27.1.37

Q11 Because Why is it important to have a trestle supporting one set of planes before the other is dismantled?

THURSDAY 28.1.37

Q12 Which end of a streamline wire is cut if alteration in length is necessary?

Q13 Give four sizes of B.S.F. bolts used on aircraft from 2 B.A

placed in R/P to make a base line from which angular measurements can be taken.

A.6 Yes, providing there is a rear landing wire to take load via the short incidence wire and rear strut.

A.7 B.A. (British Association) B.S.F. (British Standard Whitworth) Fine

A.8 a) Diameter and length of pin from under head to inside of split pin hole.

b) Diameter and overal length.

c) By size of thread

A.9 The overall length.

A.10 a) Split Pin b) Tab Washer c) Lock Nut d) Ferry Safety Pin e) Locking Plate.

A.11 Because the weight of the planes left erected would

1) Badly stress the centre-section of the fuselage.

2) Cause the aircraft to crash sideways.

A.12. The end of the righthand thread as this is made longer for this purpose.

A.13 $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$.

Q14 What precautions are taken to prevent streamline wire rusting? a) Storage. b) In use.

SATURDAY

Q15 What are control cables made of and how is their strength determined?

MONDAY

Q16 A fuselage is symmetrical about its centre line in plan. What wires are adjusted when truing a fuselage to ensure this?

Q17 How are the following identified for material:- a) Stainless Steel Fork Joints? b) H.T. Steel Bolts? c) Stainless Steel Shackle Pin?

Q18 How is the side Datum Line of a fuselage set up when the position of the Datum points are known?

Q19 State the sequence of operations to check a fuselage in side elevation.

Q20

A14 Cadmium plating is given a coat of rust preventative & wrapped in greaseproof paper. Cadmium plated is given additional anticorrosive treatment

A15 Extra Flexible H.T. Steel Wires. Their size is the diameter of the cable. The breaking strain can be found by referring to the specification sheet for the diameter of the cable.

A16 Top and Bottom Bracing Wires.

A17 a) By the absence of a collar on the shank.
b) By a groove round head.
c) By a conical indentation in the small end.

A.18 Straight edges are clamped across front and rear panels with top edges in line with datum points, thread is stretched from top side of straightedges on each side of the fuselage clear of the side struts.

A.19 a) Set up fuselage in rigging position.
b) Mark datum points on side struts.
c) Clamp straightedges at front and rear datum points.
d) Set up datum lines.

WEDNESDAY

Q20 What is the longitudinal datum line of a fuselage?

THURSDAY

Q21 How does a shouldered bolt differ from an ordinary one?

Q22 State the components which form a wire braced fuselage.

Q23 When fitting a streamline wire to an aircraft state two main points to be observed.

Q24 Give sequence of operations in truing a wire braced fuselage.

e) Check for alignments of datum points and datum line.

A20 The line in side elevation which coincides with certain known points on the side struts. The positions of the points are given in the handbook of the type of aeroplane

A21 The threaded part of the shoulder bolt is of smaller than the shank. The threaded portion of an ordinary bolt is the same diameter as the shank.

A.22 a) Longerons b) Engine Plate c) Top and Bottom Struts d) Side Struts e) Stanposts f) Bracing Wire

A23 That the wire is the correct size and that the threads are evenly engaged at each end.

A24 a) Set up the fuselage in rigging position.

b) Mark off datum points.

c) Trammel and adjust to equal lengths all internal top and bottom cross bracing wires.

A.25 ~~In places where movement is~~

d) True side bracings until marked points coincide with datum line.

e) Check steam post for vertical position.

Q25 Where are shoulder bolts used?

Q26 Before removing landing wires what precautions should be taken?

Q27 If the tail adjustment wheel in the cockpit is turned in a forward direction, what should happen to the tail plane?

Q28 For what purpose is an adjustable tail incidence gear fitted to an aircraft?

Q29 If the control column is moved to the port side of the cockpit a) what happens to the elevator?

b) what should happen to the ailerons?

Q30 In what direction should the control column be moved to raise the elevators?

Q31 State how a centre section would be checked for being correctly trued up.

A25 In places where movement is required of the parts held together by the bolt.

A26 The weight of the plane should be taken on wing tip trestles.

A27 The angle of incidence of the tail plane should increase.

A28 The main reason is to allow the aeroplane to be trimmed for horizontal flight at various speed and loads. It can also be used to relieve the pilot of the elevator controls during a sustained flight.

A29 a) Nothing.

b) The port aileron should move up and the starboard aileron should move down.

A.30 Towards the rear of the cockpit.

A31 a) Trammel front and rear bracings.

b) Check symmetry. Hang plumblines from similar points on each side of the c/s and

measure from the plumblines to corresponding standard points on each side of the fuselage.

c) Check the lateral level of the front and rear spars with straight edge and spirit level.

d) Check incidence.

e) Check stagger.

Q32 When a C/S has been trued up what are the next operations to it?

A32 a) Check tension of wires.

b) See that they are in streamline.

c) Check them for safety.

d) Lock all wires and split pins bolts, shackle pins etc.

Q33 When truing erected mainplanes where is the dihedral angle checked?

A33 On the front spars of the mainplanes.

Q34 Is the bottom plane incidence checked before dihedral

A34 No, because the angle of incidence is altered by raising or lowering the rear spar of the main plane in relation to the front spar. It is therefore necessary to adjust the front spar first.

Q35 Why is it important to true up the centre section before erection of mainplanes?

A35 Because the centre section forms the base upon which main planes are erected and can be more easily adjusted when free from the weight of the main planes.

Q36 In what sequence would main planes of an erected air frame be checked?

Q37 Why are brass locking nuts used on streamline wire?

Q38 Which wires are adjusted to obtain:—

a) Incidence? b) Dihedral?

Q39 Where is the stagger of main planes measured?

Q40 When is a tail plane said to be true?

Q41 When is a barrel type turnbuckle in safety?

A36 a) Dihedral. b) Incidence.

c) Stagger d) Symmetry.

A37 To prevent over stressing of wires or stripping of threads in tightening.

A38 a) Rear landing and flying wires.

b) Front landing and flying wires.

A39 If both planes have the same dihedral angle the stagger can be measured at any point along the planes but usually near the interplane struts. If degree of dihedral angle varies for upper and lower planes, then the stagger will not be constant throughout the span and a specified joint and measurement is usually specified.

A40 a) In side elevation when correct range of adjustment is obtainable.

b) In end elevation when it is laterally level.

c) In plan when it is symmetrical about the ℄ of the fuselage.

A41 When all the threads are covered by the barrel.

Q42 When is a tension rod type turnbuckle in safety?

Q43 When control wires are disconnected what precautions are taken to prevent damage?

Q44 When checking the range of movement of the tailplane what is meant by maximum incidence?

Q45 a) What is a fairlead?

b) What lubricant is used in conjunction with fairleads?

Q46 In what position is the control column set when adjusting aileron controls?

Q47 State briefly the correct procedure for fitting a streamline wire.

A42 When the threaded portion is screwed in at both ends past the inspection holes of the fork.

A43 They are carefully coiled up from the end that is attached to the aircraft to the free end of the cable. They are left hanging in a coil on the aircraft Care should be taken to prevent kinks when coiling controls.

A44 The position of the tailplane when the rear spar is at the lowest point of travel.

A45 a) When a cable is deflected a small degree from the straight (i.e. not more than 5°), it is made to pass through fibre blocks. These are termed fairleads.

b) No lubricant is allowed. They should be kept free of oil grease or grit.

A46 The control column is vertical in front view.

A47 Enter the L.H. thread of wire into the L.H. threaded fork joint for a certain number of turns. Remove R.H fork joint from fitting and screw

Q48 What is meant by setting?

Q49 In what position should the tailplane be when:-

a) Truing it.

b) Adjusting the controls.

Q50 Do aircraft wheels bear directly on the axle?

Q51 State what precautions should be taken with the tail adjusting gear before adjusting tail plane

it on the wire the same number of turns. Hold on to the R.H. fork-joint and turn wire until length between the fork joints is such that when screwing the right-hand fork joint into position the shackle pin can be engaged without excessive bending of the wire.

A48 Sighting the relative position of a component or straight edge.

A49 a) & b) - Normal i.e. Mid-travel - unless otherwise stated in type handbook.

A50 Yes. According to the type of aircraft wheels the bearing surfaces between wheels and axle are:-

a) Phosphor-bronze bushes.

b) Ball bearings.

c) Roller bearings.

A51 Ensure that the tail adjusting gear is in its correct position and relation to the hand wheel in the cockpit.

Q52 What operations must be done to prevent damage to ailerons before dismantling main planes?

Q53 What operations are necessary before dismantling mainplanes?

Q54 Why are hinged joints fitted to oleo struts and radius rods?

Q55 Is the movement of all control surfaces in relation to the control column the same on all aircraft.

Q56 What is the first operation prior to erecting, truing or dismantling an undercarriage?

Q57 How are the sizes of the following determined:-
a) U shackle? b) Shoulder Bolt c) Piano Wire.

Q58 In what order are the components of an airframe

A52 Stops and toggles must be fitted to the ailerons to hold them in position.

A53 a) Place trestles to support opposite main planes.

b) Disconnect all control cables and electrical connection etc. between C/S, F/U, and mainplanes.

A54 To allow the axle to move through a radius due to the shortening of the oleo struts when under compression.

A55 Yes.

A56 Remove the weight from U/C by supporting the fuselage so that the undercarriage is just clear of the ground.

A57 a) By the size of the shackle pin hole.
b) Diameter and length of plain portion.
c) By diameter in S.W.G.

A58 With fuselage supported:—

erected?

Q59 What points should be looked for when inspecting a streamline wire fitted on an aeroplane?

Q60 State how wheels are retained on axles.

Q61 Why is a special straightedge sometimes necessary when checking range of movement of a tailplane?

a) Lower Centre Section (if any).
b) Erect Undercarriage.
c) Erect upper centre section.
d) Erect Tail Unit.
e) Erect Mainplanes
f) Connect all controls.

A59 a) Test safety of wire by checking inspection holes in fork joint.
b) See that lock nuts are secure.
c) Sight for being in streamline.
d) See that correct size split pins are fitted in shackle pins.
e) Check for correct tension.

A60 a) By aluminium caps secured by shackle pins and split pins.
b) By steel caps or collars secured by bolts, nuts, and split pins.

A61 Front and rear spars are usually of varying depths and measurements must be taken

Q62 With ~~and~~ airframe standing on its wheels what part of the oleo leg struts are taking the weight.

parallel to the chord line.

A62 It varies with type of oleo strut. In one type it would be the springs, ~~in another it would be the springs~~, in another it would be the rubber rings, and in a third type the weight would be taken on the compressed air.