AIR MINISTRY
DIRECTORATE OF TECHNICAL DEVELOPMENT

CONFIDENTIAL

Specification No F. 7/30

Single Seater Day and Night Fighter

lst October 1931

1. General Requirements

(a) The aircraft is to fulfil the duties of 'Single Seater Fighter' for day and night flying. A satisfactory fighting view is essential and designers should consider the advantages offered in this respect by low wing monoplane or pusher.
The main requirements for the aircraft are:

(i) Highest possible rate of climb
(ii) Highest possible speed at 15,000 feet
(iii) Fighting view
(iv) Manoeuvrability
(v) Capability of easy and rapid production in quantity
(vi) Ease of maintenance.

(b) The aircraft must have a good degree of positive stability about all axes in flight and trimming gear must be fitted so that the tail incidence can be adjusted in flight to ensure that the aircraft will fly horizontally at all speeds within the flying range, without requiring attention from the pilot.

(c) When carrying the total load specified in paragraph 3. The aircraft must be fully controllable at all flying speeds, especially near the stall and during a steep dive, when there must be no tendency for the aircraft to hunt.

(d) The aircraft must have a high degree of manoeuvrability. It must answer all controls quickly and must not be tiring to fly. The control must be adequate to stop an incipient spin when the aircraft is stalled. An approved type of slot control, or other means which will ensure adequate lateral control and stability, at and below stalling speed, is to be embodied.

The design of the aileron control is to be such that operation of the ailerons in flight will produce the minimum of adverse yawing effect on the aircraft.

(e) The aircraft is to be designed to accommodate the equipment listed in paragraph 6 and scheduled in detail in the Appendix 'A to this specification.

(f) The crew, armament and equipment are to be arranged as specified in paragraph 7 of this Specification.

(g) The arrangements for alighting and taking off must be as specified in paragraph 8 of this Specification.

(h) The aircraft and all parts thereof are to be designed and constructed in conformity with the requirements of the Director of Technical Development, Air Ministry.

A ‘Type Record’ for the aircraft, including all drawings and a complete set of strength calculations and weight estimates must be submitted to the Director of Technical Development or his authorised representative for acceptance. The contractor, pending acceptance, may proceed with construction if he so desires, but the Director of Technical Development reserves the right to reject any part or parts so made if subsequently found to be under strength or otherwise unsuitable for H.M.Service.

Two copies of fully-dimensioned General Arrangement drawing to the aircraft as actually built, together with a General Arrangement drawing showing the layout of the complete equipment, are to be supplied to the Director of Technical Development (R.D.A3) immediately on the completion of the first aircraft. Similarly in the case of any subsequent aircraft if differing from the first.

(i) The aircraft is to be constructed throughout in metal and is to be constructed and protected as to adequately withstand sudden changes in temperature and humidity such as are experienced in semi-tropical climates. Streamline wires, tie-rods and other parts not of stainless steel are to be coated with cadmium or zinc by an approved process. Aluminium and aluminium alloy parts are to be anodically treated.

(j) As soon as possible after the mock-up conference the contractor is to supply to the Director of Technical Development (R.D.4.) a General Arrangement Drawing of the engine installation (including fuel, oil and water systems, tankage and engine controls). (See also paragraph 10).

(k) On the completion of the first aircraft off the contract the contractor shall supply to the Director of Technical Development such details of the equipment and its accessories and the detail weights, length and quantities thereof as will enable the Appendix 'A' Schedule of Equipment to be completed.

This information is to be supplied by amending a copy of the current Appendix ‘A’ to agree with the approved aircraft, in conformity with the current master schedule.

Similarly, on the delivery of the last aircraft off the contract, if alterations have been made to the equipment, a suitably amended copy of the current Appendix 'A' is to be supplied to the Director of Technical Development.

(l) All materials used must, where possible, be to B.E.S.A. or other standard Specifications as approved by the Director of Technical Development.

All materials quoted under approved Specifications are to be to the latest issue of the Specification. A list of approved Specifications showing the latest issue numbers may be obtained on application in writing to the Director of Technical Development.

Similarly, all A.G.S parts incorporated in the aircraft are to be to the latest approved issue of the appropriate drawings but the issue number should not be quoted on the aircraft drawing. Where the contractor proposes to use materials for which standard approved Specifications are not available, the contractor is required to notify the Director of Technical Development in writing, of his intention, and to supply such information and test pieces of the materials proposed as the Director of Technical Development may deem necessary, to enable adequate tests of the materials to be carried out.

(m) Two copies of rigging and maintenance notes are to be supplied to the Director of Technical Development (R.T.P.) not later than the date on which the first aircraft is delivered to the experimental establishment.

In order to facilitate further reproduction of any diagrams contained in the notes, tracings thereof are to be supplied also. The note should anticipate any difficulty likely to be encountered by the Service Unit during the development of a new type and are to include:-

(i) leading particulars, principal dimensions, and the capacities of fuel and oil tanks in tabular form;

(ii) complete and detailed instructions for rigging the aircraft;

(iii) any unusual features (including non-standard equipment from the point of view of maintenance;
(iv) lubrication instructions;
(v) description of the engine mounting and installation in so far as they are peculiar to the particular aircraft;
(vi) three-view general arrangement drawings (showing the horizontal datum line on the side view) and diagrams of the petrol and oil systems;
(vii) the approved equipment layout drawings as called for in paragraph 10 (d)

It is to be observed that these notes are required only for a preliminary guide for those who will be responsible for maintaining the aircraft in its early stages and it will suffice if they are written on the lines of a works instruction.

In the event of the aircraft being adopted for use in the Royal Air Force the contractor will be required to prepare notes and drawings covering the repair of the aircraft by Service Units.

2. Power Unit

(a) Any approved British engine may be used. It is to be noted that, when an engine is in process of development, provision is to be made in the aircraft design for a possible increase in engine weight,

(b) The installation of the engine is to be so arranged that the engine is capable of being rapidly and easily removed from the aircraft.

Supports and footholds are to be provided to facilitate minor repairs and adjustments to the engine installation.

(c) The whole of the cowling is to be designed to facilitate rapid and easy removal and replacement and is to be sufficiently robust to withstand frequent removal and constant handling, wire skewers are not to be used.

(d) The cowling is to be finished in an approved manner so as to give adequate protection against corrosion and to prevent the reflection of light which might betray the presence of the aircraft or dazzle the crew.

(e) Before drawings relative to the engine installation can be accepted the engine, fuel, oil and water systems, and the accessories and piping therefore, must be fitted in the first experimental aircraft and put in proper running order, so that the installation as a whole may be examined and, if satisfactory, approved by the Director of Technical Development, or his authorised representative.

(f) The airscrew is preferably to be of metal construction, and is to be designed in accordance with the required performance of the aircraft as specified in paragraph ll of this Specification, but no airscrew will be accepted which allows the maximum permissible r.p.m. to be exceeded in full throttle horizontal flight at the supercharged altitude of the engine, or the normal rpm.to be exceeded in full throttle climbing flight at the best rate of climb above this altitude.

A standard engine instruction plate is to be fitted in a position where it will be clearly visible to the pilot.

2. (A) Tankage including gravity tanks to be provided for the endurance specified in paragraph 3.

(a) Adequate air space is to be provided in the oil tank: at least 1 gallon for air-cooled engines and 2 gallons for water-cooled engines

(b) A gravity fuel tank is to be provided sufficient for at least 20 minutes at full throttle at ground level.

(c) The fuel tanks are to be adequately protected from deterioration in a manner approved by the Director of Technical Development and may be either:-

(i) Carried inside the fuselage

or

(ii) Carried inside the main planes. In this case the construction of the portions of the main planes containing the fuel tanks and the installation of the fuel tanks therein must be such that there can be no possibility of escaping fuel or fuel vapour from a damaged tank spreading to any inflammable portions of the aircraft structure

or

(iii) Carried externally in such a position that if damaged the escaping fuel will be blown clear of all parts of the aircraft structure when in flight.

(d) All tanks are to be provided with readily removable sumps or with approved means of removing all dirt and foreign matter from the interior of the tank.

(e) The delivery from the tank to the piping system is to be so arranged as to prevent as far as is practicable the passage of foreign matter from the tank into the piping system.

Means are to be provided, under the control of a member of the crew, for stopping and restarting the flow from any of the fuel tanks at each outlet from which the fuel would otherwise escape if the pipe line or balance pipe connected therewith were to break.

(f) Arrangements are to be made for the rapid and easy draining of the tanks, and rapid and easy filling with standard filler nozzles.

(g) All tanks are to be designed to be readily removable from and replaceable in position in the aircraft, with a minimum of disturbance to the aircraft structure and to other installations.

2. (B) Fuel and Oil Systems

(a) The fuel and oil systems shall be in general accordance with the requirements of Specification No l8 (Misc)

(b) All pipe joints are to be of approved metallic type, and together with all cocks, plugs, etc, are to be locked in accordance with A.G.S. Mod 157.

(c) The bore of the main fuel pipes must be such that the flow of fuel sufficient to maintain full power on the ground is exceeded by l00 per cent when the carburettor unions are uncoupled and the supply is in the condition of minimum head with the aircraft set at the appropriate angle so defined here under in clause (d) (i).

The last section of the delivery pipe to the carburettor is to be of the approved flexible type.

(d) The fuel feed may be either:-

(i) By approved fuel pumps from the main tanks direct to the carburettors with a by-pass to a gravity tank, so situated that, when the aircraft is flying at its maximum climbing angle, or when the aircraft is tail down on the ground, whichever condition gives the greatest inclination of the aircraft axis to the horizontal, the minimum effective head above the jet level of the highest carburettor when the gravity tank is practically empty is not less than the minimum specified for the type of carburettor used.

In calculating the minimum effective head due allowance must be made for any effect due to acceleration when the aircraft is in motion.

The delivery from the pumps to the carburettor must be via an approved release or reducing valve to a distributor cock or cocks so arranged that the following selections can be made.

(l) Pumps to carburettors and gravity tanks

(2) Pumps to carburettors direct

(3) Gravity tanks to carburettors

(4) Off

Wind driven pumps are not to be used.

An overflow pipe of sufficient bore to deal with all excess fuel must be provided from the gravity tank to the main tank or to some other approved point in the fuel system.

A prismatic flow indicator visible to the pilot is to be fitted in the overflow pipe

or

(ii) By gravity tanks alone feeding direct to the carburettor. Such gravity tanks must conform to the requirements laid down in (i) above.

(e) A diagram of the fuel system is to be affixed in an approved position in the aircraft.

(f) An approved type of petrol filter is to be fitted so that the whole of the fuel passes through it before reaching the carburettor. The filter must be disposed so that it will be accessible for cleaning.

3. (C) Cooling Systems

(a) Provision to be made for adequate oil cooling and a thermometer registering in a position visible to the pilot is to be fitted in such a position as to indicate the temperature of the oil supplied to the engine.

In addition on the first aircraft, an oil thermometer registering in a position visible to the pilot is to be fitted in the return pipe from the engine between the scavenger pump and the oil cooler.

(b) If a water or evaporating engine is used, the cooling system which is to be installed in accordance with the requirements of D.T.D., is to be designed to fulfil English summer requirements, with provision for changing to a system fulfilling Tropical summer requirements, with a minimum of alteration. If water indicators are used they are to be fitted with shutters or other approved means of temperature control.

(c) In addition to the thermometer fittings and thermometer normally required on radiators for production aircraft, the experimental aircraft is to be provided with approved thermometer fittings in the outlet header tanks or each radiator or auxiliary radiator.

4. (D) Engine Starting and Silencing

(a) The exhaust manifold of approved type supplied with the engine is to be fitted in such a manner as to provide adequately for silencing, and for flame-damping during night flying.

(b) Provision is to be made on the aircraft by the installation of the requisite approved fittings for the installation of an R.A.E. Mark II Starter and for the rapid and easy attachment of compressor type engine starter carried on a separate trolley.

(c) Provision is to be made for rapidly warming the engine oil. It must be possible to take off within 2½ minutes from a cold start.

5. Load to be carried

	Removables	Fixed	Total
Crew (1)	180	-	180lb
Oxygen	15	8	23
Instruments	1	25	26
R/T Apparatus	46	6	52
Electrical Equipment	41	17	58
Parachute and belt	20	3	23
Armament			
4 guns and C.C. gear*	120	20	140
Gun sights	-	5	6
200 rounds S.A.A.	145	-	145
Signal pistol & Cartridges	7	1	8
Military Load	575	85	660lb

*This item will be adjusted to the actual gun installation adopted

Fuel	For ½ hour at full throttle at
Oil	ground level, plus 2.0 hours at full
Water (if required)	throttle at 15,000ft
	Oil – ditto plus 50% excess
	Water - ditto

In addition to any stowages and mountings necessitated by the requirements of paragraphs 6 and 7 and by alternative loads, the following load is to be carried during the acceptance flights.

4. Contract Performance

The performance of the aircraft, as ascertained during the official type trials when carrying the total load specified in paragraph 3 and with an airscrew satisfying the requirements of paragraph 2 (e) shall be:-

Horizontal speed at 15,000 ft not less than 195 mph
Alighting speed not to exceed 60 mph
Service ceiling not less than 28,000 ft
Time to 15.000 ft not more than 8V1 mins

The specified alighting speed must not be exceeded, but may be obtained by variable camber or equivalent devices provided that control and manoeuvrability are not adversely affected.

6. Structural Strength

(a) The strength of the main structure when carrying the load specified in paragraph 3, plus 100 lb shall not be less than as defined hereunder:~

Load factor throughout the structure with the centre of pressure in the most forward position: 9.0

Load factor for wing structure with the centre of pressure in its most backward position in horizontal flight: 6.0

Load factor in a terminal nose dive: 1.75

Inverted Flight

(l) Load factor at incidence corresponding to the inverted stall and with C.P, at $^1/_3$ of the chord 4.5

(2) Load factor at incidence appropriate to steady horizontal inverted flight and at the maximum speed of horizontal normal flight: 4.5

(b) The alighting gear must be able to withstand an impact at a vertical velocity of 10 feet per second and at this velocity the load on the alighting gear must not exceed three times the fully loaded weight of the aircraft.

(c) When subject to the impact forces on alighting, as specified above, the load factor for the alighting gear must not be less than 1-l/3, and for the remainder of the structure not less than 1-l/2. The load factor for the structure and the attachment fittings of the alighting gear must always be greater than that for the alighting gear itself by the margin indicated above.

(d) The maximum weight per wheel of the aircraft in pounds must not exceed 12 times the product of the wheel and tyre diameters in inches with the aircraft carrying the full load specified above.

(e) The above factors are to be determined by the approved official methods as published by the Directorate of Technical Development and the detail requirements given in A.P. 970 are also to be satisfied. With a view to minimising the risk of flutter, attention should be given to the recommendations of R&M ll77, particularly as regards the static balance of ailerons

(f) The wing is to be sufficiently rigid to withstand satisfactorily any torsional or other loads which may be encountered during service operations.

(g) Ribs (both main plane and tail unit) are required to develop, on test factors 20 per cent greater than those specified for the aircraft as a whole.

7. Equipment

The equipment as listed hereunder and as scheduled in detail in the Appendix ‘A’ to this Specification is to be provided for and the contractor will be required to supply and fit all parts necessary for its installation; in the case of R/T panels, etc, the position for all instruments and the identities of plugs and leads must be indicated by fixed labels.

It is to be noted that the weights of various items of fixed equipment listed hereunder and scheduled in detail in the Appendix 'A', but not quoted in paragraph 3, are to be allowed for in design.

Diagrams of the wiring and piping for all equipment installations are to be provided, for carrying in a canvas bag fitted in an approved position on the aircraft.

All equipment is to be installed in accordance with the requirements of the Director of Technical Development.

(a) Armament

Reflector sight	(To be installed
Ring and Bead Sight	in accordance with
Signal Pistol and 8 cartridges	Specification
4 x 20 lb bombs	No G.E. T26)
2 x .303" Vickers guns installed	
in the cockpit under the control	
of the pilot with C.C. gear as necessary	

and either:-

(i) 2 x.303" Vickers guns installed in the cockpit or wings. If in the cockpit and synchronised an additional C.C, gear reservoir is to be fitted for them. If in the wings adequate locating arrangements are essential.

or :-

(ii) 2 x .303" Lewis guns installed so that synchronisation is unnecessary. These guns do not require heating. 2000 rounds of ammunition for the above guns with links or drums as necessary. The minimum supply to be forwarded for any gun is 400 rounds. 400 round drums will be available for Lewis guns.

(b) Electrical Equipment

Services are to be provided for:
Navigation and identification Lights
Gun Heaters
(as necessary for outboard guns)
Wing tip flares
(on concealed brackets)
Instrument Lighting

(To be installed in accordance with Specification No G,E. 164)

(c) Instruments and General Equipment

The following instruments (of luminous pattern, where available) are to be fitted in the cockpit in accordance with the requirements of the Director of Technical Development-

1 Air Speed Indicator
1 Altimeter
1 Revolution Indicator
1 Oil Pressure Gauge
Fuel Contents Gauge (1 per main tank)
1 Oil Thermometer (An extra oil thermometer is required on the first aircraft).
1 Radiator Thermometer (if required). An extra water thermometer is required on the first aircraft.
Boost Gauge (if required)
l Watch and Holder
l Compass
l Pilot's Fighting Harness (Sutton Type)
Oxygen Apparatus
1 map Case
1 Turn Indicator

(d) Wireless Equipment

Earth System, Bonding and Screening in accordance with Specification G.E. 125.
R/T Apparatus (Two-way)
R/T Box
Fixed Aerial.

(e) Parachute Equipment

1 Irving type Parachute

8. Disposition of Crew. Armament and Equipment

(a) The Pilot's view is to conform as closely as possible to that obtainable in 'pusher' aircraft. The following requirements indicate the ideal view which is considered to be necessary, and the aircraft should be designed to conform as closely to them as is possible in practice.

(b) The pilot must have a clear view forward and upward for formation work and manoeuvring, and particular care is needed to prevent his view of hostile aircraft being blanked

out by top planes and centre sections when manoeuvring to attack. Planes should be so disposed as not to obstruct the pilot's view of other aircraft, when his own is pointing within 60° of their direction.

The direction in which obstruction by planes is least serious is in the backward and downward directions.

(c) For landing a good view forward and downward is necessary, and the pilot must be able to see within 17° from the vertical over the side when wearing the Sutton harness.

The point on the ground on which the pilot desires to land should not be obstructed by planes during the gliding approach. This applies especially to normal landing manoeuvres such as banked turns and side slips.

The windscreen should be sufficiently high to enable the pilot to have a clear view forward through the screen. When taxying with the tail down the pilot, with minimum movement of his head, should be able to see directly in front of his aircraft, while with tail up for taking off he should be able to see the ground 50 feet ahead over the centre line of the aircraft, with his seat in the normal flying position. The top fuselage coaming, on either side of the windscreen, should be as narrow and tapered as possible consistent with adequate protection from the slipstream.

(d) For gun aiming purposes the pilot should have an unobstructed view forward over as wide a cone as possible, the sight being the axis of that cone with his eye the apex.

(e) The pilot is to be provided with 4 guns, and stowage for 2000 rounds of ammunition as detailed in paragraph 6(a).

Provision is to be made for fitting of a G.3 camera gun complete with firing and cocking controls. The mounting and controls must be quickly removable and must not interfere with the guns and sights in any way, This provision is secondary and must not influence the design of the aircraft in any way.

(f) The pilot is to be provided with a map case, and stowage for knee-type writing pad mounted in a convenient position.

(g) The relative positions of the pilot's seat and rudder bar are to be designed to be adjustable both vertically and horizontally to suit pilots of different trunk length and leg reach.

(h) The design of the cockpit must be such as to provide the comfort necessary for the pilot to fulfil his various duties efficiently, and must allow complete freedom of movement, particularly in an emergency that obliges the pilot to take to his parachute.

The cockpit is to be adequately screened from the wind but the windscreen must not interfere with the satisfactory use of sights, one of which should be on the centre line of the aircraft, the sights being interchangeable in position.

The cockpit is to be painted internally with an approved grey-green paint. This instruction does not apply to the instrument board.

The cockpit padding and other upholstery is to be rendered fireproof to the satisfaction of the Director of Technical Development.

(i) Standard clips are to be provided under the wings for the carrying of one standard bomb rack for 4 x 20 lb bombs.

Room is to be provided to enable the bomb release gear for these bombs to be fitted inside on the port side of the cockpit.

The arrangement of the bomb carrier installation must be such that sufficient clearance is provided to enable the bombs to be released even when the aircraft is in a very steep dive.

(j) Arrangements are to be made to provide adequate cockpit heating without resort to electrical appliances.

(k) The dynamo for the electrical equipment is to be stowed internally and driven from the engine. The aircraft designer must agree the details of the drive with the engine designer

B. Arrangements for alighting and taking off

(a) The aircraft is to be designed to pull up quickly on alighting and wheel brakes of an approved type are to be fitted.

The brake controls shall be such that the brakes can be applied together or independently. lt is essential that the pilot shall not be obliged to abandon the aircraft or engine controls when applying the brakes. Means are to be provided for locking the brakes in the 'on' position so that wheel chocks may be dispensed with if so desired. The whole of the braking system is to be capable of rapid and easy removal when not required.

(b) The aircraft is to be suitable for operation from small, rough—surfaced and enclosed aerodromes.

(c) The alighting gear is to be of oleo or equivalent type in which the use of rubber in tension is eliminated.

(d) The wheel track of the alighting gear must be such as to provide stable taxying conditions in any direction in a wind of 20mph without any tendency for the aircraft to capsize.

(e) The wheels of the alighting gear are to be provided with approved means for lubricating the wheel bearings, which are to be designed so that no wear takes place on the axle.

(f) The design and disposition of the alighting gear are to be such as to allow of the aircraft being readily and securely supported without the use of elaborate jacking, trestling or slinging during and subsequent to the removal of the alighting gear or the wheels of the alighting gear. If necessary, special arrangements are to be made in the design of the aircraft structure to permit of such support being readily given and the points of support so specially provided must be clearly marked in the aircraft.

9. Miscellaneous

(a) The aircraft is to be constructed in quickly detachable units for ease of transport and storage

(b) Means are to be provided for locking the slats in the closed position and maintaining the controls in a central position when the aircraft is left unattended on the ground. The means so provided must preclude the possibility of the pilot attempting to takeoff with the slats and/or the controls locked.

(c) Suitable holding down rings are to be provided under the bottom planes.

(d) The aircraft is to be provided with all necessary handgrips and other facilities for ease of handling on the ground.

(e) Provision is to be made in the design for the protection of all moving parts against the destructive effects of sand and, as far as may be possible, for their lubrication by grease gun from a central point.

(f) Detachable covers of approved type are to be supplied for the engine and cockpit as a protection against deterioration when the aircraft is pegged down in the open.

(g) The attachment points for the pilot's fighting harness together with those parts of the aircraft to which the belt loads are transmitted are to be capable of withstanding the failing load of the belt or harness.

(h) The design of the structure in the vicinity of the cockpit is to be such as to afford the pilot as much protection as possible in the event of a heavy landing, or crash or overturning.

Such structure should be appreciably stronger than the adjacent parts so that these latter may absorb some of the shock by deformation before the former yields.

(i) The design of the aircraft is to be such that standard Service equipment can be used for ground operations such a fuelling, rigging, manhandling, etc. Particulars of service ground

equipment can be obtained on application in writing to the Director of Technical Development (R.D.A.5.).

(j) The design and layout of the aircraft is to be such as to offer every facility for rapid and easy inspection and maintenance in service and, in general, is to permit of maintenance operations being performed with standard Service equipment.

Special equipment (including tools) shall be provided with the aircraft if an essential supply, but the introduction of non-standard articles is to be avoided whenever possible.

(k) Parts that require to be frequently replaced or inspected are to be easily accessible, and fully visible to a mechanic working on them

(l) Control cables are to be arranged so that the deterioration due to wear is a minimum. Means are to be provided to facilitate the fitting of new cable and its rapid threading through fairleads. The splicing of cable in place is prohibited.

(m) Positive-locking devices shall be provided for all joints and fastenings; such devices are to be rapidly and easily adjustable.

(n) Adequate facilities are to be provided for inspecting the fuselage interior and working parts, particularly those of the tail skid and tail plane adjusting gear.

(o) Arrangements are to be made for defining the position of the centre of gravity in accordance with Aircraft Design Memorandum No 205.

10. Provision of Mock-up

(a) In order that the proposed disposition of the crew, armament etc., may be properly examined and approved by the Director of Technical Development before construction is commenced the contractor is required to provide a suitable ‘mock-up‘ of the aircraft at his works, The 'mock-up’ so provided must include all parts and components which are likely to interfere with the all-around view from the cockpit and must shew the internal arrangements of the cockpit and such details of the engine installation as the arrangements for engine starting and the positions of cocks, pumps, etc.

(b) The ‘mock-up‘ must be erected full size and must be constructed true to scale and all instruments and equipment must be represented full size.

(c) The ‘mock-up‘ must be capable of being inclined at angles corresponding to the cruising and alighting attitudes of the aircraft and to this end must be constructed to the correct height from the ground,

(d) Within 10 days of the mock-up conference the contractor is to submit to the Director of Technical Development (R.D.A.4.) two copies of provisional drawings of the layout as decided at the mock-up.

Four copies of the layout drawings as finally approved are to be supplied to the Director of Technical Development (R.D.A.4).

These equipment layout drawings are to be at 1/8th scale and are to consist of skeleton views of the fuselage and other pertinent structure shewing views of all equipment.

(1) positioned on the starboard side of the aircraft, viewed from the inside;

(2) positioned on the port side, viewed from inside.

(3) positioned in plan, together with

(4) full views of instrument boards, WIT panels, etc. and

(5) a schedule of equipment indexed to correspond to ‘balloon' pointers (a spare column is to be provided for notes or alterations).

Each of the drawings is to shew also seats, tanks, controls, etc. appropriate to each view.

In accordance with the procedure laid down in Aircraft Design Memorandum No 135 the contractor is to supply a bare W/T panel as and when required.

11. Test Specimens

(a) The Contractor will be required to supply and ordinarily test (see clause (d)) such specimens of parts of the aircraft as the Director of Technical Development may consider should be tested in order to ensure that the design and construction of the aircraft will be satisfactory.

(b) Tenders for the supply of aircraft in accordance with this specification are to include a Schedule of the specimens and tests considered sufficient to meet the requirements of clause (a) and are to cover the cost of supplying and testing the specimens. Any schedule that is considered by the Director of Technical Development to be inadequate will be returned to the firm concerned for amendment

(c) The specimens and tests that will generally be essential are indicated hereunder

Complete ribs.	The specimens are to be tested under the conditions of normal flight and, when appropriate, inverted flight. Metal ribs will be required to undergo, in addition, a vibration test.
Metal Spars	The specimens will be submitted to the standard test, if applicable, and otherwise to such test as the Director of Technical Development may require.

(d) Except as provided for hereafter, the testing shall be done by the Contractor, or he shall arrange for it to be done at some approved Testing Establishment; in either case, due notice of the time and place of the tests shall be given to the Director of Technical Development so that he may arrange for a representative to witness them; the conditions governing the tests are to be in accordance with the requirements of the

Director of Technical Development and the tests are to be performed to his satisfaction; reports on the tests are to be supplied to the Director of Technical Development in duplicate. If neither of the aforementioned arrangements is possible, the tests will be done at the Royal Aircraft Establishment, at the Contractor's expense.

(e) The Director of Technical Development reserves the right to call for specimens and tests additional to those referred to in the Contractor's Schedule, should he at any time after the placing of the contract consider them to be necessary.

(f) No specimen of any part of the aircraft shall be submitted for testing without it being previously certified by the inspector-in-Charge at the Contractor's works, that the specimen is typical, as regards materials, dimensions, limits and workmanship of the actual part.

(g) A thin coat of oil or vaseline may be applied to metal specimens to prevent corrosion. Varnish, enamel or similar substances must not be used for this purpose.

12. Provision of Drawings for a Model

If at any time the Director of Technical Development shall so desire, the contractor shall supply the drawings and data necessary for the construction of a true-to-scale model of the complete aircraft suitable for aerodynamic trials in a wind tunnel; such drawings, if required, would form the subject of an amendment to contract.

13. Publication of Test Results

The Director of Technical Development reserves the right to publish data contained in reports of any wind tunnel or other tests relating to the design of the aircraft which may be undertaken on his behalf.

14. Pre-acceptance Test Flights

(a) Prior to the delivery of the aircraft to the Departmental Establishment at which the Type Trials are to take place it shall have been certified to the Director of Technical Development

(i) That the aircraft has been subjected by the contractors pilot to the flight tests referred to in the 'Statement of Special Contract Conditions' accompanying the contract

and

(ii) that these tests have shewn that the aircraft is sale to be flown by pilots of the Royal Air Force.

(b) The tests referred to in la) shall include:~

(i) A demonstration that the aircraft may be spun, both to the right and to the left, without undue risk when loaded in accordance with paragraph (3) of the Specification and with the Centre of Gravity at the aft authorised limit. For this purpose it is required that the aircraft, after being put into a spin, shall be allowed to complete not less than eight turns before the pilot sets his controls for recovery. The aircraft will be deemed satisfactory as regards its behaviour in a spin if the height loss in recovery does not exceed 1500 feet. This height loss is to be reckoned from when the pilot sets his controls for recovery until the aircraft 'flattens out' from the landing dive.

(ii) A dive to the terminal velocity.

(iii) A demonstration of satisfactory behaviour during normal aerobatics such as the loop, roll, stalled turns, etc.

AIR MINISTRY
Directorate of Technical Development