PILOT'S NOTES
AND MUSTANG IA
MUSTANG IA AEROPLANE

ALLISON V-1710 F.3R AERO-ENGINE
OR
ALLISON V-1710-F.3R/M AERO-ENGINE

Prepared by direction of the
Minister of Aircraft Production

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AIR MINISTRY
AMENDMENT CERTIFICATE

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Holders of the Pilot's Notes will receive only those amendment lists applicable to the preliminary matter, introduction and Sections 1 and 2.

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Note to official users

Air Ministry Orders and Volume II leaflets as issued from time to time may affect the subject matter of this publication. It should be understood that amendment lists are not always issued to bring the publication into line with the orders or leaflets, and it is for holders of this book to arrange the necessary linking-up.

Where an order or leaflet contradicts any portion of this publication, an amendment list will generally be issued, but when this is not done, the order or leaflet must be taken as the overriding authority.

Where amendment action has taken place, the number of the amendment list concerned will be found at the top of each page affected, and amendments of technical importance will be indicated by a vertical line on the left-hand side of the text against the matter amended or added. Vertical lines relating to previous amendments to a page are not repeated. If complete revision of any division of the book (e.g., a Chapter) is made, this will be indicated in the title page for that division and the vertical lines will not be employed.
LIST OF SECTIONS

(A detailed Contents List is given at the beginning of each Section)

Introduction
Illustration
  Mustang I Aeroplane - Port Side View
Section 1 - Controls and equipment
Section 2 - Handling and flying notes for pilot
- INTRODUCTION -

Note. - The following introductory notes are complementary to the detailed description given in Volume I of this Air Publication.

1. The Mustang I Aeroplane is a single seat fighter, low wing monoplane designed for high speed and combat service. The aeroplane is powered with an Allison Model V-1710-F3R, 12-cylinder, "V" type, liquid-cooled engine provided with a Bendix-Stromberg injection type carburettor. Replaceable upper cowlings with carburettor air filters are provided as extra equipment. Provision is made for connecting an external accumulator to facilitate starting engine. The right-hand rotating tractor propeller, of steel or aluminum, is of the Curtiss constant speed, three-bladed electrically controlled type. The aeroplane is equipped for gunnery and navigation. Except for fabric covered tail unit control surfaces, metal construction is used throughout. The aeroplane has a span of 37 feet 5/16 inches, an overall length of 32 feet 2 5/16 inches, and an overall height of 12 feet 8 inches with tail down.

2. The fuselage is of aluminum alloy, semi-monocoque construction, divided into three sections, the engine mount section, the main fuselage section and the aft section. An overturning pylon is located aft of the pilot's seat. Armour plate is provided as the fireproof bulkhead, and provisions have been made to install an armour plate aft of the pilot's seat. A bullet proof transparent glass is provided aft of the windscreen. The cockpit is under a flush type transparent cockpit hood with an upper and port side section hinged to open for ingress and egress of the pilot. A sliding window is incorporated in both side sections. A readily detachable window, aft and at both sides of the pilot, is provided for rear vision and access to radio equipment. The cockpit hood, as a unit, can be completely released to provide an emergency exit. Provisions are made for heating and ventilating the cockpit and defrosting the windscreen. On most of these aeroplanes a Glycol spray system is provided for the windscreen.

3. The main plane is a semi-monocoque, full cantilever structure and consists of two sections bolted together. The sections are of the low drag type employing the laminar flow type airfoil. The ailerons are metal covered. The starboard aileron is equipped with a booster tab and the port aileron is equipped with a combination booster and trimming tab, the latter controllable from the cockpit. Wing flaps extend from the ailerons to the fuselage, are of the sealed aileron type, and are hydraulically operated.
4. The undercarriage consists of two main oleo legs and a steerable tail wheel. All three units are fully retractable into recesses provided and are hydraulically operated. The tail wheel is capable of swivelling 360° and is steerable within the range of rudder pedal travel. The wheels of the main oleo legs are fitted with hydraulic brakes.

5. The tail unit is a full cantilever structure, with a semi-monocoque fin and tail plane. The rudder and elevator are fabric covered, equipped with combination booster and trimming tabs, the latter controllable from the cockpit.

6. Each main plane section at the root end contains a fuel tank of the self-sealing type. An automatic fuel tank sump selector valve, actuated gravitationally, interconnects the forward and aft tank outlets with the pipes leading to the main selector valve to ensure sufficient feed to the engine during steep climbs or dives. Further facilities for providing the engine with sufficient fuel during manoeuvres consist of the installation of a bulkhead with flapper valves at inward end of each tank to form a fuel chamber at fuel tank outlets and the installation of an automatic electric booster pump. A vent suction relief valve is incorporated in both fuel tank vent lines located at both sides of the fuselage, just forward of the radiator. The function of the check valves is to provide a vent for the fuel tanks in the event of adverse conditions should icing occur at the external vent line inlet. A spring-loaded flapper within the valve will open under adverse conditions, thus providing a vent in the fuel system. Provisions are made for the installation of four interconnected auxiliary tanks in place of the machine guns in each main plane section gun bay to extend the range of the aeroplane. The tanks are not self-sealing. All fuel pipes are of flexible hose for protection against gunfire. Refer to the fuel system diagram, Figure 4, of Section 1.

7. The pressed aluminum sheet oil tank is located between the engine and fireproof bulkhead. The vent lines, baffles with flapper valves, hopper for accelerated oil warming and swivelling sump in the oil tank are so designed as to allow the aircraft to assume any attitude when tank is full, and feed adequately in a vertical climb or dive when tank is only one-fourth full.

8. The pressed aluminum sheet coolant tank is located forward of the engine with armour plating between the tank and propeller spinner. The oil-coolant radiator is located at the bottom of the fuselage, aft of the cockpit with forward and aft adjustable air-scoops. The radiator is cylindrical in shape and is divided into two concentric radiators, the outer one utilised for coolant, the inner one for oil, providing a compact installation and good grouping of the metal tubing for protection against gunfire. A ratchet valve is provided in the hydraulic operating system to prevent scoop from opening in case of malfunctioning from gunfire. An automatic relief valve is provided to permit oil at excessive pressure, which results when oil is cold, to by-pass the oil radiator.
9. Provisions are made in the fuselage for two .50 calibre Browning synchronized machine guns, one at each lower side of the engine. One .50 calibre and two .30 calibre Browning machine guns can be installed in the leading edge of each main plane section. The outboard .30 calibre guns of each main plane are equipped with 814 rounds of ammunition each, and the inboard .30 calibre guns are equipped with 932 rounds each. The .50 calibre guns in the main plane are equipped with 300 rounds each. The .50 calibre guns in the fuselage are equipped with 300 rounds each. Heating is provided for the gun compartments of the main plane by means of a warm air Stewart-Warner heater. Each heater is capable of 10,000 B.T.U./hr.

10. A Fairchild W7-B camera can be installed in the leading edge of the port main plane tip. Exposure is controlled by the gun firing switch and the camera may be operated selectively or simultaneously with the gun.

11. An automatic signal recognition device is provided with control at the starboard side of the pilot’s seat.

12. An oxygen regulator is situated at the lower starboard side of the cockpit and a normal and overload oxygen bottle aft of the radio equipment.

13. Type R-3003 radio equipment is installed with provisions for alternate installation of types TR9D and TR1133A aft of the pilot’s seat.

14. An Eclipse 30 volt, 50 ampere engine-driven generator is provided. A generator control unit is connected in the generator circuit and is adjusted to allow the generator to deliver a maximum voltage output of 28.5 volts. A generator filter is also connected to the generator circuit. The filter has an attenuation of better than 50 decibels over the range of 4 to 300 megacycles.

15. Conventional navigation lamps are provided on the upper and lower surface of the main plane tips and at the trailing edge of the rudder. Landing lamps are situated at the leading edge of each main plane section. Upper and lower identification lamps are situated aft of the aerial mast and forward of the tail wheel, respectively. Two formation-keeping lamps, one at each side of the fuselage, are provided to illuminate the upper surface of the main plane. The cockpit is illuminated by two swivel type lamps, one at each side of the cockpit. The instrument panel is illuminated by means of indirect lighting. All flight instruments are individually lighted. The controls for all lighting facilities are mounted on their respective switch panels in the cockpit.
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CONTROLS AND EQUIPMENT
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MUSTANG IA AIRCRAFT

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Hydraulic system diagram (Radiator air-scoop and deflector)
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SECTION I

PILOT’S CONTROLS AND EQUIPMENT
AND GENERAL EMERGENCY EQUIPMENT AND EXITS

The layout of the flying and operational controls is illustrated in figs 2 and 3 at the end of this Section, each item being given a number which is quoted when the item is referred to in the text.

INTRODUCTION

1. The Mustang I is a low wing monoplane single seat fighter of metal construction. It is powered by an Allison V-1710 F3R engine fitted with a 3-blade Curtiss electric constant-speed propeller. There is provision for two 0.5 inch Browning guns in the fuselage, and one 0.5 inch and two 0.30 inch Browning guns in each wing.

MAIN SERVICES

2. Fuel System

* (i) Two 70 gallon tanks, one in each wing, supply fuel. There is provision also for installing two interconnected auxiliary tanks in each wing in place of the wing guns. When fitted, the auxiliary tanks feed through the main tanks and do not feed direct to the engine. The total capacity of the auxiliary tanks is 45 gallons.

(ii) The vapour return line is connected to the port main tank.

3. Oil System

(i) The oil tank has a capacity of 10.1 gallons, plus an air space of 1.2 gallons.

(ii) The cylindrical oil cooler is situated within the circular coolant radiator; a bypass valve opens under the pressure of cold oil and returns cold oil to the tank without passing it through the oil cooler. The oil cooler temperature is controlled by the radiator air scoop and, when fitted, the air scoop deflector.

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A 70 GALLON TANK IN THE PORT WING AND A 40 GALLON TANK IN THE STARBOARD
4. **Hydraulic system**

(i) The brake system and the engine-pump-operated hydraulic system both draw fluid from the same hydraulic reservoir, but otherwise have entirely separate pipe lines. The brake system draws from a large diameter stackpipe within the reservoir which contains a reserve supply for the brakes.

(ii) The engine-driven hydraulic pump operates

- Undercarriage and fairing doors
- Flaps
- Radiator air scoop
- Air scoop deflector (fitted only on AG664 and earlier aeroplanes)

(iii) A handpump (36) is provided for operating all the services when the engine pump is not running. The handpump draws fluid from a separate pipe line at the bottom of the reservoir; as the engine pump draws from a 4½ inch stackpipe this leaves a reserve of fluid for handpumping should the engine pump line fail. The handpump power line, however, joins the engine pump line just before the selector valve.

(iv) On AG 664 and earlier aeroplanes a hydraulic control knob (63) is fitted on the port side of the instrument panel. This knob must be pushed in and released before any of the services can be operated; hydraulic pressure is then available for about 2 minutes, at the end of which the hydraulic control knob will automatically have returned to its normal position. The hydraulic pressure gauge on the port instrument panel will register only when a hydraulic service is being operated.

On AL 958 and subsequent aeroplanes no hydraulic control knob is fitted, and hydraulic pressure is immediately available on selecting any service. On these aeroplanes a hydraulic accumulator is fitted which provides a reserve of hydraulic pressure when the engine pump is not running. An unloading valve directs engine pump pressure back to the reservoir when the accumulator pressure reaches 1000 lb./sq.in. The hydraulic pressure gauge will record the accumulator pressure at all times.
5. **Pneumatic system.** An engine-driven vacuum pump supplies a vacuum for operating the gyro instruments. The suction gauge should indicate 3\(\frac{3}{4}\) - 4\(\frac{1}{2}\) inches Hg. If the vacuum pump is inoperable an alternative source for operating the turn-and-bank indicator only is derived from the carburettor air intake.

6. **Electrical system.** An engine-driven generator and an accumulator supply current for operating:

- Cockpit lighting
- Instrument lighting
- Landing lamps
- Navigation and identification lights
- Undercarriage warning lights and horn
- Gun firing and heating
- Gun sight
- Cameras
- Radio
- Pressure head heater
- Oil dilution solenoid
- Electric constant-speed propeller controls
- Engine electric starter and booster coil
- Fuel booster pump

**AEROPLANE CONTROLS**

7. **Rudder.** The rudder pedals (17;93) are adjustable for leg reach in flight. Push the adjusting lever on the inside of the pedal towards the centre of the aeroplane to disengage the locking plunger, then push pedal to desired position and release lever. There are five possible positions; make sure that both pedals are in the same position.

8. **Flying control locking gear.** A locking plunger (22) is mounted on the floor immediately in front of the control column. To lock rudder and control column, centralise rudder pedals; withdraw locking plunger and put column forward so that the lip on the control column fits in the locking socket and the holes are aligned; then release plunger.

9. **Trimming tab controls.** Control knobs and indicators for elevator (69), aileron (77), and rudder (80) trimming tabs are mounted on the port side of the cockpit. The movements are:

- Elevator - clockwise - nose down
- Aileron - clockwise - right wing down
- Rudder - clockwise - nose right
10. Vacuum selector control for instrument flying. The vacuum selector (8) is on the starboard side of the instrument panel. Normally it should be up at VAC. PUMP, which supplies vacuum for all the gyro instruments; if the vacuum pump fails, turn to ALT. SOURCE; this will only operate the turn and bank indicator.

11. Tail wheel lock. The tail wheel can be either steerable over a range of 6° either side, with the rudder, or fully castoring. The locking lever (70) is on the port side of the seat; with the lever down the tailwheel is locked in the steerable position; to unlock and render fully castoring, pull out the handle on the end of the lever and twist to secure it; then pull back the lever until it clicks into position. To lock the tailwheel, twist the handle and allow handle and lever to spring back to the locked position. When taxiing, always use the fully castoring position to avoid ruining the tail wheel tyre.

12. Undercarriage selector lever.

(i) This lever (68) is on the port side of the cockpit near the floor. When the full weight of the aeroplane is on the wheels, the undercarriage selector cannot be moved to UP and the undercarriage cannot be raised.

(ii) On AG 664 and earlier aeroplanes.

(a) Before selecting DOWN or UP the spring-loaded grip handle must be pulled up to release the catch, which engages in slots at the UP (aft) or DOWN (central) positions. The hydraulic control knob (65) must first be pushed in.

(b) Emergency down-lock operation. If the down lock springs fail, the down lock pins can be pushed home mechanically by pulling the undercarriage selector lever out and then pushing it fully forward; the hydraulic control knob (65) should be pressed in immediately before putting the selector forward, to ensure that the wheels are fully DOWN.
(iii) On AL 958 and subsequent aeroplanes

(a) Before selecting DOWN or UP, the selector lever (68) must be moved to starboard to release the catch which engages in slots at the UP (aft) or DOWN (forward) positions.

(b) On these later aeroplanes the down locks are hydraulically operated and there is no emergency position of the undercarriage selector.

13. Undercarriage EMERGENCY Knob. This knob (57) is on the port side of the instrument panel. When it is pulled out hydraulic fluid is allowed to by-pass in the system and the undercarriage doors will then open and the oleo legs will lower, under their own weight. Leave undercarriage selector (68) DOWN; this places the down locks in readiness to engage with the oleo legs - it may be necessary to rock the aeroplane from side to side to lock the wheels down.

14. Undercarriage position indicators

(i) Mechanical indicators. Two indicators (76), sliding in slots on the control pedestal on the port side of the cockpit, show the position of the oleo legs at all times. They do not indicate whether the up or down locks are engaged.

(ii) Warning lights.

(a) The undercarriage warning lights (58) are on the port side of the instrument panel. The centre light (red or green) indicates the tail wheel position and the outer lights the main wheels. Indications are:

- Locked down: Green
- Locked up or between locks: Red.

The lights may be dimmed for night use by turning the central knob anticlockwise; and they may be tested by pressing the knob in.

(b) Two red warning lights (12) on the lower starboard side of the instrument panel indicate when the undercarriage doors are not locked up.
15. Flaps

(i) The flap selector lever (74) is on the aft face of the control pedestal on the port side of the cockpit. The lever clicks into each of the three positions UP, neutral, DOWN. To partially lower or raise the flaps, put flap selector to DOWN or UP, and return selector to neutral when the desired position is shown on the flaps position indicator (67). It is not necessary to return the flap selector to neutral after fully lowering or raising the flaps. On AG 664 and earlier aeroplanes, the hydraulic control knob (63) must be pushed in before the flaps can be operated.

(ii) The flaps position indicator (67), on the control pedestal, is mechanically connected to the flaps and shows the position at all times. The full flap travel is 50°.

16. Hydraulic handpump. The handpump (36) is on the right of the seat. To operate, pull out handle and twist anti-clockwise to lock. Then put selector lever to desired position and work handpump up and down. It is not necessary to push in hydraulic control knob.

17. Brakes

(i) The brakes are operated by the rudder pedals (17, 93), differentially or in unison.

(ii) The PARK BRAKE knob (65) is on the bottom centre of the instrument panel. To park, depress both rudder pedals, pull PARK BRAKE and hold, release pedals, then release PARK BRAKE. To release the parking brakes, depress both rudder pedals.

ENGINE CONTROLS

18. Throttle.

(i) On aeroplanes in which automatic boost control is not fitted, a stop is provided at the take-off position.
(ii) When Claudel Hobson automatic boost control is fitted:

(a) All-out level boost is obtained with the throttle lever (61) fully forward.

(b) The boost control is not fully automatic and when climbing the throttle lever (61) must be advanced from the sea-level climbing position to maintain the boost with increasing height. The control prevents the boost from rising beyond the maximum permissible.

19. Mixture control. A Bendix-Stromberg injection carburettor is fitted, and the control lever (56) moves forward from FULL RICH through AUTO RICH, AUTO LEAN to IDLE CUT OFF. The FULL RICH position is for emergency use only in the event of the automatic mixture control breaking down. To stop engine, move mixture control to IDLE CUT OFF.

20. Propeller speed controls. The Curtiss electrical propeller controls are as follows:

(i) Safety switch (82), on the forward switch panel. This must be ON for operation of the constant speed propeller. The switch will be opened automatically if there is an excessive load on the propeller circuit, but can be reclosed by putting it ON again.

(ii) Four-position selector switch (81), on the forward switch panel. When the switch is in the central position, the constant speed control is not working and the propeller pitch is fixed. The DEC. RPM MANUAL and INC. RPM MANUAL positions are used to change the pitch as desired, and on release the switch will spring back to the central position and the propeller will again be in fixed pitch. The AUTO position brings the constant speed governor unit into action and is used in conjunction with the propeller speed control (62). If the electric power supply fails the propeller will remain fixed at the pitch it happens to be in at the time.

(iii) The propeller speed control (62) is on the port sidewall. When the selector switch (81) is at AUTO, the propeller speed control in the forward FINE PITCH position gives maximum r.p.m. To reduce r.p.m., move control back towards COARSE PITCH.
21. Carburettor air intake

(1) There is no cockpit control for carburettor air intake heat. A spring loaded door allows warm air to enter the carburettor when the air intake becomes iced up.

(11) On A.L.958 and subsequent aircraft, there is provision for fitting a Vokes air intake filter.

22. Radiator air scoop

The radiator air scoop selector (73) is on the control pedestal and clicks into the OPEN, LOCK, or SHUT positions. To partially open the radiator scoop, put selector to OPEN, then return it to LOCK when the desired position is indicated on the mechanical RADIATOR indicator (67) (beside the flaps position indicator). On AG.664 and earlier aircraft, the hydraulic control knob must be pushed in before the scoop can be operated.

23. Air scoop deflector. (Fitted only on AG.664 and earlier aircraft). To lower the air scoop deflector, pull the latch (71) beside the radiator scoop selector (73) sideways and move the radiator scoop selector fully forward. The hydraulic control knob (65) must be IN. The air scoop deflector should be lowered when starting the engine, diving, or during long glides, or if oil coring occurs.

24. Fuel cock control. The fuel cock (92) on the cockpit floor has three positions: RIGHT (forward), LEFT (aft) and OFF (starboard).

NOTE. If Mod.No.575 is not incorporated, the fuel cock (92) on the cockpit floor has four positions: RIGHT (forward), LEFT (port), RESERVE (aft) and OFF (starboard). LEFT draws fuel from a stackpipe in the port tank, and leaves 26 gallons in reserve; RESERVE draws fuel from the bottom of the port tank. RIGHT draws fuel from the bottom of the right tank.
25. Fuel booster pump

(i) If mod. No. 344 has been carried out, the fuel booster pump is brought into action when the propeller is in the FINE PITCH position. There is also a manual switch beside the propeller speed control lever (62) wired in parallel with the propeller switch, so that the booster pump may be switched ON if it is required when the engine pump is not running or at high altitude. Normally this switch is kept OFF and the booster pump is automatically controlled by the propeller speed control.

NOTE: that when the booster pump is not running the compass deviation will be different and the appropriate deviation card must be used.

(ii) In aeroplanes in which mod. No. 344 has not been incorporated, the fuel booster pump will be controlled manually by the switch (84) on the forward switch panel which was designed to control the wing gun camera.

26. Priming pump. The priming pump (6) is on the top starboard side of the instrument panel. To operate, push in handle and twist counter clockwise to unlock. Then withdraw handle and pump. After priming is complete, push handle home and turn clockwise to lock.

27. Ignition switch. When the ignition switch (87), on the forward switch panel, is OFF the following circuits are put out of operation: pressure head heater, gun firing system, undercarriage position indicators, engine electric starter, and fuel booster pump. When the ignition switch is turned to BAT the undercarriage indicator is switched on; the other circuits will be on when their respective switches are closed. The magnetos are not on until the ignition switch is turned to L (port magneto only), R (starboard magneto only) or BOTH.
28. **Engine starting.**

(i) **Electric starter.** The switch (83) for the inertia starter, on the forward switch panel, moves down to **ENERGISE** the electric motor and flywheel, and up to **ENGAGE** flywheel with engine. The motor should never be energised for more than 20 seconds. An external accumulator socket is provided on the starboard side of the fuselage below the rear vision window.

(ii) **Hand starting.** A hand crank and shaft, for energising the starter flywheel by hand, are stowed in the starboard wheel well. The starting socket is reached through a hole in the bottom of the engine compartment. To engage the flywheel, the electric starter switch (83) in the cockpit must be moved to **ENGAGE** when the flywheel has been hand-cranked up to speed.

29. **Oil dilution.** The oil dilution switch (85) is on the forward switch panel.

**Cockpit Equipment**

30. **Pilot's seat.** The pilot's seat, the back of which is armour plated, can be adjusted for height in nine positions by a handle on the starboard side of the seat.

A handle on the port side of the seat releases the Sutton harness to allow the pilot to lean forward.

31. **Hooding.**

(i) To unlock hood from outside the aeroplane, pull up on the handle on the upper channel of the port transparent panel; fold top panel over to starboard and allow port panel to fold outwards and down. The panels should not be swung back carelessly as the hinges may get damaged and a badly fitting hood may result.

(ii) To close the hood from inside the cockpit, raise the port panel, and pull the top panel over. Pull back the red lever on the top forward corner of the port panel, and release so that port panel engages with the top panel.
To open the hood from inside the cockpit, pull back the red lever, gently fold back the top panel and let the port panel down.

32. **Windows.** The port and starboard transparent panels have sliding panels. To open, pull back the handle at the base of the window and slide back.

33. **Windscreen.** On A.G.664 and earlier aeroplanes, an armour plate glass is mounted directly behind the forward windscreen panel. The armoured glass can be hinged down to enable the inner side of the windscreen to be cleaned; the gun sight must first be hinged back. On A.L.958 and later aeroplanes, the forward windscreen panel itself is composed of armoured glass.

34. **Ventilation.** On A.G.366 and earlier aeroplanes, the cold air control is a knurled knob (75) on the floor at the left of the pilot's seat. On A.G.367 and subsequent aeroplanes, the cold air control consists of a directly operated door at the ventilating shaft outlet, on the floor beside the control column.

35. **Heating.** The warm air control (35) is a knurled knob on the floor at the right of the pilot's seat. Turning the knob clockwise permits warm air from the radiator to enter the cockpit.

36. **Cockpit lighting.** Two swivelling lights (25, 78), one on each cockpit wall, are controlled by a rheostat (89) on the forward switch panel.

37. **Instrument lighting.**

(i) The compass and gyro instruments are directly lighted and are controlled by a rheostat (90) marked FLIGHT INSTR. LIGHTS on the forward switch panel.

(ii) The other instruments are illuminated by indirect lighting controlled by a rheostat (88) marked PANEL INST. LIGHTS.

38. **Oxygen.** A high-pressure oxygen master valve is situated on the floor at the starboard side of the pilot's seat. The oxygen regulator (23) is on the starboard sidewall in early aeroplanes, and on the starboard side of the floor at the rear of the seat in later aeroplanes.
39. Desert equipment. Stowage is provided in the radio compartment aft of the pilot's seat for a drinking-water container, water bottle, emergency rations, and ordinary rations.

OPERATIONAL EQUIPMENT

40. Gun selector control. The gun selector (52) is on the port side of the instrument panel and has four positions - OFF, WING, ALL and FUS. (fuselage) This permits the wing guns alone, both fuselage and wing guns, or the fuselage guns alone to be selected. The control should be kept OFF when the guns are not in use.

41. Gun firing control. The gun firing button is on the control column. The control operates the guns through solenoids and the circuit is arranged so that if a solenoid on one side of the aeroplane is defective, the corresponding solenoid on the other side will also go out of action. When the guns are fired the radio transmitter is automatically switched off.

42. Gun heater control. The gun heat control (64) is on the bottom of the port instrument panel. The control operates the fuel-air mixture valve for the heater unit and a switch to start combustion. The heat control should be turned OFF when firing and after landing.

NOTE: - do not switch ON heat before taking off, or the engine may cut out.

43. Gun charging. The fuselage gun chargers (3,48) are mounted at each side of the instrument panel. There are three positions:

(i) Safety lock position - pull control aft and out about one inch.

(ii) Gun loading. Pull straight back to extreme aft position, then return fully forward.

(iii) Gun cooling. To cool the guns, pull straight back and turn clockwise to engage in the extended locked positions.
44. Gun sights.

(i) A reflector gun sight (51) is provided. (On some aeroplanes this has been replaced by a periscopic gunsight). The gun sight lamp is controlled by a rheostat (53) on the instrument panel.

(ii) On A.G.664 and earlier aeroplanes the gun sight may be hinged back to allow the armoured glass to be hinged. To hinge the gun sight, extract the locking plunger by means of the knurled knob at the port side.

(iii) An auxiliary ring and bead sight is provided. The bead is permanently mounted on the fireproof bulkhead; the ring is stowed in clips on the underside of the instrument panel shield. To install the ring, pull the knurled knob on the bracket on the windscreen frame.

45. Cameras.

(i) On some aeroplanes a Fairchild gun camera is installed in the leading edge of the wing, or in the nose. The gun camera safety switch (84) is on the forward switch panel, and camera gun firing is controlled by the gun firing trigger on the control column.

(ii) On other aeroplanes a G.45 camera is installed in the wing instead of the Fairchild camera. The safety switch (84) is on the forward switch panel; the camera firing switch is on the control column. A footage indicator is installed on the floor on the starboard side of the control column.

(iii) On Army Co-operation aeroplanes an F.24 camera is installed. The control box for the F.24 camera is on the floor on the port side of the control column; the camera heating switch for the F.24 camera is beside it.

NAVIGATIONAL, SIGNALLING AND WIRELESS EQUIPMENT

46. Radio.

(i) In army co-operation aeroplanes, an Army 19D radio set is installed. The controller is on the port side of the cockpit.
(ii) Alternative provision is made for installing T.R.9D or T.R.1133A, if Army 19D radio is not fitted. The controller (79) is on the port side of the cockpit.

(iii) The remote contactor (13) and the normal/special switch (10) are on the starboard side of the instrument panel.

(iv) R.3003. The control unit is on the starboard side of the cockpit; the ON-OFF switch (34) and the destruction buttons (32) are aft of the control unit.

(v) The pilot's microphone socket (31) is on the R.3003 control unit.

47. Signal discharger.

(1) The signal discharger operating handle (37) is at the aft starboard side of the seat. Pull up to release each signal. Six signals are provided.

(ii) If mod.313 has been incorporated, a preselector is fitted above the R.3003 control unit; pull up to safe position; in this position the desired signal can be selected by pulling the operating handle once for each cartridge to be passed over; when the desired signal has been selected, move preselector down to firing position, then pull operating handle to fire signal.


(1) Switches for the navigation lights (45) are on the starboard switch panel.

(ii) The identification switchbox and key (11) is above the starboard switch panel. Two switches for the DOWNWARD and UPWARD identification lights have three positions, MORSE, OFF, STEADY. To signal with either lamp, place appropriate switch to MORSE and signal with key. The spring pressure on the morse key can be adjusted by turning a small thumbwheel at the forward end of the switchbox.

49. Landing lamps. The switches (41,42) for the landing lamps are on the starboard switch panel.
DE-ICING EQUIPMENT

50. Windscreen defrosting

(i) On early aeroplanes a system of exhaust-heated air is provided for defrosting the windscreen. The control knob (47) is on the top port side of the instrument panel. Pull out to defrost windscreen.

(ii) On A.G.615 and subsequent aeroplanes, a glycol spray for de-icing the windscreen is provided. The glycol pump is at the aft port side of the pilot's seat. A drain cock is provided beside the glycol pump, which should be used for draining off any fluid in the pipes before take-off. If there is any fluid left in the pipes, the forward vision during take-off may be obstructed.

51. Pressure head heater. The pressure head heater switch (45) is on the starboard switch panel.

EMERGENCY EXITS AND EQUIPMENT

52. Parachute exit. The hood can be released for parachute exit by pulling back the red emergency release handle (9) on the starboard side of the cockpit, and pushing straight up on the hood. Normally the emergency hood release is wired up; it should be ensured that the wire seal is unbroken before taking off, or the hood may fly off.

53. Crash exit. To escape from an aeroplane which has overturned on the ground, pull back the hood locking control on the top port panel, and push outward sharply on the port panel.

54. Fire extinguisher. A hand fire extinguisher is provided at the aft port side of the seat.

55. First-aid kit. The first aid kit is stowed above and behind the pilot's seat, between the over-turning pylon struts.

56. Aircraft destruction.

On later aeroplanes, there is provision for an incendiary bomb on the cockpit floor.

F.S/9
APPENDIX TO SECTION 1.
MUSTANG IA AIRCRAFT

This aircraft has 4 x 20 mm. cannon armament in the wings. It differs from the Mustang I in the following respects:

Throttle control. Delco Remy automatic boost control is fitted. This is fully automatic and will maintain any selected boost up to full throttle height, with the exception that, when taking off with the throttle lever set to the take-off position, the boost will drop by about one inch immediately the aircraft becomes airborne, and will then maintain this boost.

A stop is provided at the take-off position, which consists of a plunger held in position by a wire (not visible to the pilot); to obtain war emergency boost, the throttle lever is pushed against the stop, thus operating the plunger and breaking the wire; the plunger will then remain in the war emergency position until reset by the ground staff; but the boost control will still regulate at any boost to which the throttle lever is set.

Carburettor air intake. A manually controlled alternative warm air intake is provided. The control is on the top left hand corner of the instrument panel. Normally the control will be kept in the locked cold position, i.e., control in and handle twisted so that the arrow on the handle points to the left. The hot air intake should only be used under icing conditions; to obtain hot air, unlock by twisting handle so that arrow points to the right, pull control out, and twist anti-clockwise to lock.

Gun firing controls. The safety switch on the forward switch panel must be on before the guns can be fired. (NOTE: If mod. 344 has not been incorporated, this switch will be used to operate the booster pump). The guns are fired by a trigger and a button on the control column; operation of both trigger and button operates all four cannons at once. Operation of the trigger alone fires the two inboard cannons only. Operation of the button alone will not fire any of the guns. After the ammunition for the two inboard guns has been exhausted, the two outboard guns may be fired by operating both the trigger and the button switch simultaneously.

Windscreen deicing pump. A glycol pump for deicing the windscreen is fitted on the left-hand side of the instrument panel.
NOTE THAT ON AL748 AND SUBSEQUENT AEROPLANES THE UNDERCARRIAGE SELECTOR HAS NO EMERGENCY DOWN POSITION.
Key to fig. 2

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Windshield defrosting control</td>
</tr>
<tr>
<td>48</td>
<td>Port fuselage gun charging handle</td>
</tr>
<tr>
<td>49</td>
<td>Clock</td>
</tr>
<tr>
<td>50</td>
<td>Suction indicator</td>
</tr>
<tr>
<td>51</td>
<td>Optical gun sight</td>
</tr>
<tr>
<td>52</td>
<td>Gun selector control</td>
</tr>
<tr>
<td>53</td>
<td>Optical gun sight lamp rheostat</td>
</tr>
<tr>
<td>54</td>
<td>Airspeed indicator</td>
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<tr>
<td>55</td>
<td>Artificial horizon</td>
</tr>
<tr>
<td>56</td>
<td>Mixture control</td>
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<tr>
<td>57</td>
<td>Undercarriage emergency down control</td>
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<td>58</td>
<td>Undercarriage visual position indicator</td>
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<tr>
<td>59</td>
<td>Altimeter</td>
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<tr>
<td>60</td>
<td>Turn indicator</td>
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<tr>
<td>61</td>
<td>Throttle control</td>
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<tr>
<td>62</td>
<td>Manual propeller pitch control</td>
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<tr>
<td>63</td>
<td>Hydraulic system pressure control</td>
</tr>
<tr>
<td>64</td>
<td>Fuselage guns heater control</td>
</tr>
<tr>
<td>65</td>
<td>Parking brake control</td>
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<tr>
<td>66</td>
<td>Engine controls quadrant friction disc</td>
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<tr>
<td>67</td>
<td>Wing flap and radiator air-scoop mechanical indicators</td>
</tr>
<tr>
<td>68</td>
<td>Undercarriage selector handle</td>
</tr>
<tr>
<td>69</td>
<td>Tail wheel lock control</td>
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<tr>
<td>70</td>
<td>Elevator trimming tabs control</td>
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<td>71</td>
<td>Air-scoop deflector control</td>
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<td>72</td>
<td>Port fuel tank gauge</td>
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<tr>
<td>73</td>
<td>Radiator air-scoop control</td>
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<tr>
<td>74</td>
<td>Wing flap control</td>
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<tr>
<td>75</td>
<td>Cold air control</td>
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<td>76</td>
<td>Undercarriage mechanical indicators</td>
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<td>77</td>
<td>Port aileron trimming tabs control</td>
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<td>78</td>
<td>Port cockpit lamp</td>
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<td>79</td>
<td>TR9D radio control</td>
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<tr>
<td>80</td>
<td>Rudder trimming tabs control</td>
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<tr>
<td>81</td>
<td>Propeller pitch control switch</td>
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<td>82</td>
<td>Propeller safety switch</td>
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<td>83</td>
<td>Engine starter control switch</td>
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<tr>
<td>84</td>
<td>Gun camera safety switch</td>
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<tr>
<td>85</td>
<td>Oil dilution switch</td>
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<tr>
<td>86</td>
<td>Undercarriage warning horn cut-out</td>
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<tr>
<td>87</td>
<td>Ignition switch</td>
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<tr>
<td>88</td>
<td>Instrument panel lights rheostat</td>
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<tr>
<td>89</td>
<td>Cockpit lamps rheostat</td>
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<tr>
<td>90</td>
<td>Flight instrument lights rheostat</td>
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<tr>
<td>91</td>
<td>Port sliding window control</td>
</tr>
<tr>
<td>92</td>
<td>Fuel selector valve control</td>
</tr>
<tr>
<td>93</td>
<td>Port rudder and brake pedal</td>
</tr>
</tbody>
</table>

**Note that these controls are not fitted on A.L. 958 and subsequent airplanes.**
Key to fig. 3

1. Engine unit
2. Glycol temperature indicator
3. Starboard fuselage gun charging handle
4. Rate of climb indicator
5. Engine tachometer
6. Engine priming pump
7. Manifold pressure indicator
8. Vacuum system selector switch
9. Cockpit hood emergency release control
10. Radio control
11. Upper and lower identification lamps control
12. Undercarriage doors position indicator lights
13. Remote contactor
14. Spare lamps container
15. Forward switch panel
16. Control column
17. Starboard brake and rudder pedal
18. Starboard switch panel
19. Map and data case
20. Aperiodic compass
21. Cold air control valve
22. Surface controls locking gear
23. Oxygen system regulator
24. Mounting bracket for radio control unit
25. Starboard cockpit lamp
26. Mounting for oxygen
27. Starboard sliding window control
28. Stowage for aircraft disabling device
29. Starboard fuel tank gauge
30. Radio R3003 control unit 24 volt supply plug box
31. Radio jack plug
32. Radio R3003 crash switches
33. Sutton harness stowage hook
34. Radio R3003 remote control switch
35. Warm air control
36. Hydraulic system hand-pump
37. Automatic recognition device control
38. Starboard formation-keeping (flood) lamp
39. Generator ammeter
40. Generator main line switch
41. Port landing lamp switch
42. Starboard landing lamp switch
43. Navigation lamps switch
44. Formation-keeping (flood) lamps switch
45. Pressure head heater switch
46. Aeroplane check-off list holder
FIG. 4

FUEL SYSTEM DIAGRAM

SEE AL 5/C. NOTE THAT WHEN MOD. NO. 345 IS INCORPORATED THE STANDPIPE (CENTRE PIPE) IN THE PORT MAIN TANK IS BLANKED OFF AND THE RESERVE PIPELINES BECOME THE MAIN PIPELINES FOR THE PORT TANK.
NOTE: FOR RADIATOR AIR SCOOP AND DEFLECTOR DETAILS REFER TO COOLANT SYSTEM DIAGRAM.

OIL TANK DETAILS

ENG. GAUGE (REF.)

TO CAPILLARY

OIL DILUTION SOLENOID

COOLANT RADIATOR (REF.)

OIL COOLER RADIATOR

SPRING LOADED BY-PASS VALVE

LEGEND

MAIN

DILUTION

VENT & DRAIN

PRESSURE

ENG. DRAIN BOX (REF.)

OIL DILUTION & DRAIN VALVE

FIREPROOF BLK'HD. (REF.)

ENGINE PUMP

CAPILLARY TO ENG. GAUGE

OIL PRESSURE

VENT LINE

FIG. 5

OIL SYSTEM DIAGRAM
NOTE: That no air scoop deflector is fitted on A.L.95B and subsequent airplanes.
NOTE:
REFER TO FIGURES 7 TO 10 FOR THE INDIVIDUAL UNIT OPERATING SYSTEMS.

LEGEND:
- • RETURN TO RESERVOIR (ALSO FREE FLOW)
- ■ ENGINE PUMP SUPPLY FLOW (ALSO FREE FLOW)
- ▲ ENGINE PUMP PRESSURE FLOW (ALSO FREE FLOW)
- ○ HAND PUMP SUPPLY FLOW
- ▼ HAND PUMP PRESSURE FLOW
- ▲ DEFLECTOR VALVE PRESSURE FLOW
- ▼ DEFLECTOR VALVE RETURN FLOW
- • RETURN TO RESERVOIR FLOW

FIG. 7
HYDRAULIC SYSTEM DIAGRAM
(Power Pipe Lines)

NOTE: THAT THIS DIAGRAM APPLIES TO AEROPLANES UP TO A.G.L. 6500 ONLY.
LEGEND

- U.C. & TAIL WHEEL UP PRESSURE FLOW
- U.C. & TAIL WHEEL DOWN PRESSURE FLOW
- U.C. FAIRING DOOR UP PRESSURE FLOW
- U.C. FAIRING DOOR DOWN PRESSURE FLOW
- WING FLAP UP PRESSURE FLOW
- WING FLAP DOWN PRESSURE FLOW
- U.C. DOWN COMPENSATING FLUID SUPPLY FLOW
- U.C. FAIRING DOOR EMERGENCY LOWERING VALVE FLOW

NOTE:
U.C. = UNDERCARRIAGE

NOTE:
REFER TO FIGURE 7 FOR THE GENERAL POWER AND FLUID SUPPLY SYSTEMS.

FIG. 8

HYDRAULIC SYSTEM DIAGRAM
(UNDERCARRIAGE, TAIL WHEEL AND WING FLAP)

FIG. 8
A.P.2025A  PILOT'S NOTES  VOL.I  SECT.I

BRAKE SYSTEM DIAGRAM

FIG. 10

MASTER BRAKE CYLINDER
BLEEDER PLUG AND CAP
ANCHOR BRACKET CASTING
DUST SHIELD (PISTON AND PISTON SEAL INSIDE)

INSULATOR RING
PRESSURE RING

KEYS FOR BRONZE DISCS
RETAINING AND ADJUSTMENT NUT

STATIONARY STEEL DISC
ROTARY BRONZE DISC

MASTER BRAKE CYLINDER
FLEXIBLE HOSE
FLEXIBLE HOSE

HYDRAULIC SYSTEM FLUID RESERVOIR
PARKING BRAKE KNOB
MASTER BRAKE CYLINDER
A

FLEXIBLE HOSE
MAIN PLANE PIPE DISCONNECT BLOCK
FLEXIBLE HOSE

BRAKE PEDAL

VIEW A-A
BRAKE PEDAL AND CYLINDER

DETAIL B
BRAKE ASSEMBLY

SEE DETAIL B
SECTION 2

HANDLING AND FLYING NOTES FOR PILOT
SECTION 2
HANDLING AND FLYING NOTES FOR PILOT

Note:— The flying technique outlined in these notes is based on A.P.129, Flying Training Manual Part I, Chapter III, and A.P.2095, Pilot's Notes General, to which reference should always be made if further information is required.

1. ENGINE DATA, ALLISON V-1710 - F5R.

(1) Fuel:— 100 octane only.

(11) Oil:— See A.P.1464/G.37.

(iii) The principal engine limitations are as follows:

<table>
<thead>
<tr>
<th></th>
<th>R.p.m.</th>
<th>Boost inches</th>
<th>Temp °C</th>
<th>Coolant W</th>
<th>Oil S</th>
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<td>TO 1000 FRET</td>
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<td>MAX. CLIMBING</td>
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<tr>
<td>MAX. COMBAT 5 MINS. LIMIT</td>
<td>3,000</td>
<td>45¼+</td>
<td>125</td>
<td>75</td>
<td>95</td>
</tr>
</tbody>
</table>

*If automatic boost control is fitted, emergency boost of 56 inches at 5,000 r.p.m. is permitted for 5 minutes provided that propeller is under automatic control, and sparking plugs type Champion C.348 (Store Ref. 157B/213), C.358 (Store Ref. 157B/214) or A.C. 18/85 (Store Ref. 157B/214) are fitted. The use of 56 inches boost must be reported to the engine officer.

DIVING: Maximum boost 45½ inches

MINN. TEMP. FOR TAKE-OFF: OIL

- Winter grade 35°C
- Summer 40°C

COOLANT - 85°C.
### OIL PRESSURE

<table>
<thead>
<tr>
<th>Normal</th>
<th>65 lb/sq.in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.</td>
<td>80 lb/sq.in.</td>
</tr>
<tr>
<td>Minm. for flight</td>
<td>55 lb/sq.in.</td>
</tr>
<tr>
<td>&quot; &quot; IDLING</td>
<td>15 lb/sq.in.</td>
</tr>
</tbody>
</table>

(iv) Fuel pressure:
- Normal: 12/16 lb/sq.in.
- Minm. for idling: 10 lb/sq.in.

### ENGINE DATA, ALLISON V-1710 - F3R/M.

(1) **Fuel:** 100 octane only.

(ii) **Oil:** See A.P.1464/C.37.

(iii) The principal engine limitations are as follows:

<table>
<thead>
<tr>
<th></th>
<th>R.p.m.</th>
<th>Boost inches</th>
<th>Temp °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. TAKE-OFF TO 1000 FEET</td>
<td>3,000</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>MAX. CLIMBING CONTINUOUS</td>
<td>2,600</td>
<td>38</td>
<td>120</td>
</tr>
<tr>
<td>MAX. LEVEL CONTINUOUS</td>
<td>2,600</td>
<td>38</td>
<td>120</td>
</tr>
<tr>
<td>MAX. WEAK CONTINUOUS</td>
<td>2,300</td>
<td>30</td>
<td>120</td>
</tr>
<tr>
<td>MAX. COMBAT 5 MINS LIMIT</td>
<td>3,000</td>
<td>50</td>
<td>125</td>
</tr>
</tbody>
</table>

*Full throttle is permitted for 5 minutes provided that propeller is under automatic control, and sparking plugs Champion C.34S (Stores Ref. 137/B/213), Champion C.35S (Stores Ref. 137/B/214) or AC type LS/65 (Stores Ref. 137/B/215) are fitted.*

**DIVING:**
- Maximum boost: 47 inches
- R.p.m.: 3125

**MINM. TEMP. FOR TAKE-OFF:**
- OIL: Winter grade 35°C
  - Summer: 40°C
- COOLANT: 85°C

**OIL PRESSURE:**
- Normal: 65 lb/sq.in.
- Max.: 80 " " "
- Minm. for flight: 55 " " "
- " " IDLING: 15 " " "

(iv) Fuel pressure:
- Normal: 12/16 lb/sq.in.
- Minm. for idling: 9 lb/sq.in.
(v) Check that wire seal for emergency hood jettison release is not broken.

(vi) Before the first start of the day, it is advisable to clear the carburettor of air by switching on booster pump and moving mixture control to AUTO RICH for a second, then returning to IDLE CUT-OFF. Time should then be allowed for excess fuel to escape from the supercharger drain.

6. STARTING ENGINES AND WARMING UP

(i) Set fuel cock to RESERVE.

(ii) Set engine controls as follows:

- Throttles: ½ inch open
- Mixture: IDLE CUT-OFF
- Propeller: Safety switch ON. Selector switch AUTO. Speed control fully forward.
- Radiator: Radiator air scoop SHUT and air scoop deflector DOWN (if fitted). NOTE that hydraulic control knob must first be pushed in, if fitted.

(iii) Have the engine turned by hand for at least two revolutions of the propeller.

(iv) If Mod. 344 is not incorporated, switch on fuel booster pump. (If Mod. 344 is incorporated booster pump will automatically be ON when propeller speed control lever is fully forward).

(v) Prime engine 3 - 4 full strokes if the engine is cold, and 1 - 2 strokes if engine is hot, immediately before starting.

(vi) Switch on ignition and energise starter until the hum becomes constant. Never exceed 20 seconds.
(vii) Return starter switch central; pause for a second and engage starter. In cold weather additional priming may be given as soon as the engine starts turning and should be continued until it is running.

(viii) When the engine begins to fire regularly, move mixture control slowly to AUTO RICH and stop priming. If engine shows signs of being over-rich, return to IDLE CUT-OFF until it is running smoothly.

(ix) If engine fails to start:

(a) Stop priming and move mixture control to IDLE CUT-OFF.

(b) Wait till propeller stops rotating.

(c) Switch off ignition.

(d) Ensure that flywheel stops rotating by engaging starter for a second, then return switch central.

(e) Have propeller turned forward half a revolution by hand to ensure that flywheel is not engaged with the engine.

(f) If the engine has been overprimed, open the throttle and have propeller turned forward by hand.

(x) Run the engine as slowly as possible for half a minute, then warm up at 1,000 r.p.m.

(xi) Turn off priming pump - (Push and turn to lock).

(xii) Open radiator air scoop as necessary.

7. TESTING ENGINE AND INSTALLATIONS

While warming up -

(i) Check temperatures and pressures, and test operation of flaps on engine-driven pumps and also on the hand-pump.
After warming up:

(i) Check operation of constant speed propeller. At over 25 inches boost the full range of r.p.m. must not be tested.

(iii) Open up to the take-off catch (or fully forward if automatic boost control is fitted) and check take-off boost and r.p.m.

(iv) With propeller speed control fully forward, close throttle until r.p.m. fall to 2,200 and test each magneto in turn. The drop should not exceed 100 r.p.m.

8. TAXYING

(i) If black smoke comes out of the exhaust it is a sign that the engine needs clearing. Open up briefly to about 2,200 r.p.m.

(ii) Check that cockpit hood is locked and tail wheel unlocked - tail wheel locking lever pulled out and up. Taxying with locked tailwheel will damage the tailwheel tyre.

(iii) Check operation of brakes when starting to taxi.

(iv) The view forward is poor and care must be taken to avoid collision with obstacles on the ground.

(v) The air scoop must not be fully down.

9. FINAL PREPARATIONS FOR TAKE-OFF

The drill of vital actions is (H), T, M, P, fuel, flaps, radiator and gun heat control.

H - Hydraulic control - IN (NOTE that on A.L. 958 and subsequent aircraft this knob is not fitted).

T - Trimming tabs - Elevator 3° back

M - Mixture - AUTO RICH

P - Propeller - Safety switch ON

Selector switch AUTO. Speed control fully forward.
Fuel

- Check contents of tanks.
  Fuel cock RESERVE.

Flaps

- 15° down

Radiator

- Radiator air scoop OPEN. Air scoop deflector UP (if fitted)

Gun heat control

- OFF.

10. TAKE-OFF

(i) Taxi forward a few yards and lock tailwheel.

(ii) (a) Until automatic boost control is fitted, open the throttle slowly to the catch.

(b) If automatic boost is fitted, open the throttle slowly to the fully forward position.

(iii) The aeroplane is very blind forward during the early part of the take-off run.

(iv) At low speeds the elevator control is poor.

(v) There is a tendency to swing to the left which can be held on the rudder.

(vi) Check that hydraulic knob (if fitted) is IN before raising undercarriage.

(vii) Safety speed is 120 m.p.h. I.A.S. Raise the flaps at 500 feet.

(viii) If Mod.344 is not incorporated, switch off fuel booster pump after reaching 1,000 feet.

11. CLimb

(i) The speed for maximum rate of climb is 170 m.p.h. I.A.S. up to 11,000 feet. Above this height reduce speed by 2 m.p.h. per thousand feet.
(ii) The climbing angle is steep and the forward view is poor.

(iii) Do not open the radiator scoop more than is necessary to keep oil and coolant temperatures within the limitations.

12. OIL CORING

Oil cooler coring may occur with great rapidity and oil and coolant temperatures must be watched continually. The radiator scoop should be opened only if both oil and coolant temperatures are too high. Coring will be indicated by a rapid rise of oil temperature to over 100°C with (generally) a 20°C drop in coolant temperature. Close the radiator air scoop and lower the deflector (if fitted) until oil temperature is restored. Generally open only so far as is necessary to keep temperature within the limitations.

13. ECONOMICAL CRUISING

(i) The recommended speed for maximum range is 185 m.p.h. I.A.S.

(ii) Fly in weak mixture at 1,700 r.p.m. and adjust throttle to give recommended speed. If the recommended speed cannot be obtained at full throttle, increase r.p.m.

14. FUEL CONSUMPTION AND CAPACITY

(i) The fuel consumptions in weak mixture at 15,000 feet are:

<table>
<thead>
<tr>
<th>Boost ins. Hg.</th>
<th>R.P.M.</th>
<th>2300</th>
<th>2100</th>
<th>1900</th>
<th>1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 1/2</td>
<td>57</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>28</td>
<td>48</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>27</td>
<td>44</td>
<td>41</td>
<td>39</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>38</td>
<td>36</td>
<td>35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>23</td>
<td>34</td>
<td>32</td>
<td>30</td>
<td>28 1/2</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>-</td>
<td>31</td>
<td>26</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>
The fuel consumptions in rich mixture at 15,000 feet are:

<table>
<thead>
<tr>
<th>R.P.M.</th>
<th>Boost ins.Hg.</th>
<th>Gallons/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000</td>
<td>42</td>
<td>113</td>
</tr>
<tr>
<td>2,600</td>
<td>35½</td>
<td>88</td>
</tr>
</tbody>
</table>

The tank capacities are:

- Starboard tank: 60 gallons
- Port tank: 70 gallons
- Total: 130 gallons

15. GENERAL FLYING

(i) Stability.— The aeroplane is stable longitudinally, laterally and directionally.

(ii) Change of trim.—

- Undercarriage down — Nose down
- Flaps down — Nose down

The directional trim changes at low speeds as speed and power is varied.

(iii) The trimming tab controls are sensitive and must be used with care.

(iv) Flying at low altitude in rain or bad visibility.

Lower flaps to 15°, reduce speed to 140 m.p.h. I.A.S. and increase r.p.m. to 2,600. Check radiator and oil temperature frequently.

16. STALLING

(i) The stalling speeds at 8,500 lb. are:

- Flaps and undercarriage up: 92 m.p.h. I.A.S.
- " " " " " down: 82 m.p.h. I.A.S.
The aeroplane sinks rapidly as stalling speed is approached; therefore keep well above stalling speed when flying near the ground.

As the column is pulled back gently the right-hand wing tends to drop and a right-hand spiral will develop, unless held up by aileron and rudder. If the column is pulled right back the aeroplane will spin with the rudder central. At high acceleration loads, juddering gives warning of approaching stall.

17. SPINNING

Deliberate spinning is not permitted. An accidental spin can be checked at once by normal methods.

18. DIVING

(1) The aeroplane is very steady in the dive. It becomes slightly tail heavy and there is a slight tendency to yaw to the right.

(ii) If automatic boost control is not fitted, the boost rises rapidly with loss of height.

(iii) The propeller should be set for 2,600 r.p.m.

19. AEROBATICS

The following speeds are recommended:

- Roll: 200 m.p.h. I.A.S.
- Loop: 250 m.p.h. I.A.S.
- Half roll off loop: 300 m.p.h. I.A.S.
- Climbing roll: 375 m.p.h. I.A.S.
- Upward roll: 400 m.p.h. I.A.S.

20. APPROACH AND LANDING

(1) Lock the tail wheel.

F.S/5
(ii) Press in hydraulic knob (if fitted) and close radiator air scoop as necessary.

(iii) Reduce speed to 170 m.p.h. I.A.S. and carry out the drill of vital actions (H), U, M, P and flaps.

NOTE that speed must not exceed 165 m.p.h. I.A.S. when lowering flaps.

H - Hydraulic control knob - IN (if fitted)

U - Undercarriage

- DOWN; check that green indicator lights show and that undercarriage lever catch engages.

M - Mixture

- AUTO RICH

P - Propeller

- Safety switch ON Selector switch AUTO. Speed control fully forward.

Flaps

- Fully down

(iv) Approach speeds are:--

- Engine assisted Glide
  - 110 m.p.h.I.A.S.
  - 120 m.p.h.I.A.S.

21. AFTER LANDING

(i) Press hydraulic knob IN (if fitted), raise flaps, and open radiator air scoop as necessary before taxying.

(ii) Stopping engine.--

(a) SHUT radiator air scoop.

(b) With propeller speed control fully forward, at 1,200 r.p.m. move mixture control to IDLE CUT-OFF.

(c) After engine ceases to fire, switch OFF ignition and turn OFF fuel.
22. OIL DILUTION IN COLD WEATHER

The oil dilution period is 4 minutes. See P.2035/4.

23. UNDERCARRIAGE FAILURE

(i) Undercarriage warning lights (red) and mechanical indicators showing that wheels have failed to lower:

(a) Undercarriage lever DOWN; pull out EMERGENCY knob. The wheels will fall under their own weight.

(b) If wheels do not lock down, rock the aeroplane from side to side. See (iii) below.

NOTE: If the wheel should for any reason jam up, return EMERGENCY selector to normal, and attempt to lower by handpump - pull cut pump handle and turn counter-clockwise to lock in extended position.

(c) Return EMERGENCY knob to normal position. Select flaps DOWN. If engine pump is not effective, attempt to lower flaps by handpump.

(ii) Undercarriage lowered (shown by mechanical indicators), but green lights not indicating locked down:

To test whether the downlocks have failed or whether it is merely a failure of the warning lights:

(a) Pull EMERGENCY knob (to by-pass fluid); Selector lever DOWN.

(b) Side-slip sharply to right. If the right-hand wheel is not locked it will be shown by movement of its mechanical indicator.

(c) Repeat for left-hand wheel.

(d) When test is complete return EMERGENCY knob to normal position.
(iii) If the above test shows that undercarriage is not locked down (or if red lights are still on and warning horn sounds):

On A.G. 664 and earlier aeroplanes only:

(a) Press hydraulic control knob IN. When hydraulic pressure gauge shows approximately 1,000 lb/sq. in., move undercarriage selector lever fully forward. This pushes the lockpins home. Let go; the undercarriage selector will automatically return to DOWN.

(b) Wait till hydraulic pressure falls then repeat test of para. (ii).

(c) If test shows that wheels are still not locked down; check that EMERGENCY knob is in, and maintain hydraulic pressure in jacks by pressing in hydraulic control knob just before landing, or by operating handpump.

On A.L. 958 and subsequent aeroplanes:

(a) There is no emergency position of the undercarriage selector.

(b) If the wheels are down but not locked, check that EMERGENCY knob is in, and see that pressure is maintained on the gauge. If it is not, operate the handpump.