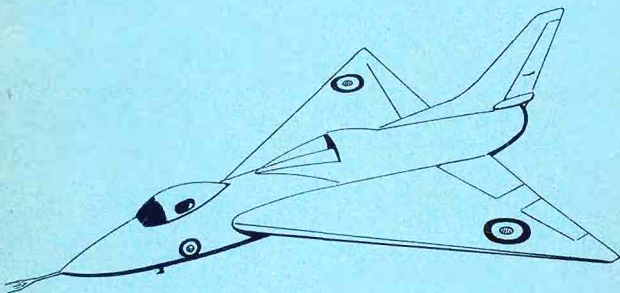


PILOT'S NOTES
FOR
AVRO TYPE 707B



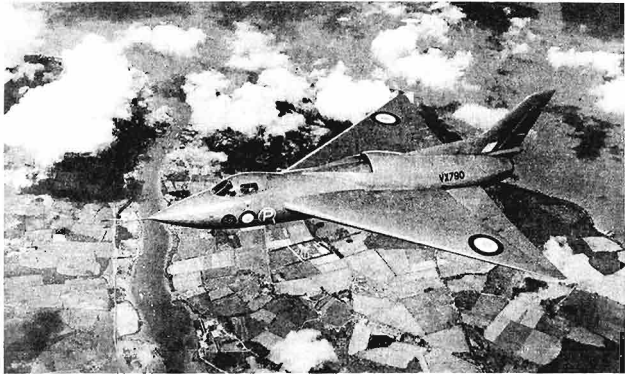
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NOTE TO USERS

These notes are complementary to A.P.2095 Pilot's Notes General and assume a thorough knowledge of its contents. All pilots should be in possession of a copy of A.P.2095.

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SEPTEMBER, 1951.



AVRO TYPE 707 B

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PILOT'S CHECK LIST

(Excluding items of special test equipment).

EXTERNAL CHECKS

ITEM	CHECK	ITEM	CHECK
1.Port main plane.	Condition of leading edge and surfaces.	9.Rudder.	Condition. Geared tab. Yaw damping tab. External lock removed.
2.Port wing tip.	Condition.	10.Starboard main plane.	Condition of undersurface.
3.Port aileron.	Condition. Geared tab. Trim tab. External lock removed.	11.Starboard under-carriage.	Condition of tyre. Oleo-leg extension appears normal. Chock in position. Jury strut in position.
4.Port elevator.	Condition. Spring tab. Trim tab. External lock removed.	12.Starboard elevator.	Condition. Trim tab. Spring tab. External lock removed.
5.Port main plane.	Condition of undersurface.	13.Starboard aileron.	Condition. Geared tab. External lock removed.
6.Port under-carriage.	Condition of tyre. Oleo-leg extension appears normal. Chock in position. Jury strut in position.	14.Starboard wing tip.	Condition.
7.Rear fuselage.	All access doors secure. Anti-spin parachute safety pins in position. Propulsion nozzle cover removed.	15.Starboard main plane.	Condition of leading edges and surfaces.
8.Fin.	Condition. Pitot head cover removed.	16.Starboard side nose.	Condition. Access panels secure.

ITEM	CHECK
17. Pitot mast.	Pitot head covers removed. Yaw vane unlocked.
18. Battery stowage.	Retracted and locked.
19. Port side nose.	Condition. Access panels secure.
20. Nose under-carriage.	Condition of tyre. Shock-absorber extension appears normal. Nose wheel in line fore and aft. Nose wheel bay clear of loose equipment.
21. Under side nose.	Venturi-pitot cover removed.
22. Air intake.	Air intake cover removed.
23. Open canopy, using external lever, using ladder.	Enter cockpit.
INTERNAL CHECKS	
24. Equipment.	Loose equipment stowed.
25. Internal control locking.	Removed.

ITEM	CHECK
26. Vision panels.	Clear and undamaged.
27. Seat.	Adjust for height as required. Head rest adjusted.
28. Rudder pedals.	Adjust for leg length as required.
29. Harness.	Fit and adjust harness. Operation of harness release.
30. Ejector seat.	Ejector gun sear safety pin removed. Head-blind safety pin in position. Drogue gun sear pin removed.

COCKPIT

31. Ground/flight switch.	Set to FLIGHT. Check voltage of internal batteries. Have ground supply plugged in. Set to GROUND.
32. Radio supply circuit breakers (2)	OFF
33. Engine master switch.	OFF

ITEM	CHECK	ITEM	CHECK
34. Auto-observer supply circuit breaker.	OFF.	45. Oxygen regulator.	Turn ON. Contents gauge FULL. Flow indicated. Action of economiser. Turn OFF.
35. Booster pump circuit breakers. (2)	OFF.	46. Pneumatic pressure.	2,000 lb. per sq. in.
36. Pitot head heater switches (2).	OFF.	47. Emergency air pressure.	2,000 lb. per sq. in.
37. Pitot head test buttons (2)	Press one at a time. Note ammeter reading (4 to 5 amp).	48. Under-carriage door warning light.	ON.
38. Booster pump test buttons (2).	Press one at a time. Note ammeter reading. (7 amp).	49. Under-carriage indicator.	GREEN LIGHTS ON.
39. Compass	Set.	50. Under-carriage selector switch.	DOWN.
40. Fuel contents gauge.	FULL	51. Camera switch.	OFF.
41. Low level warning light.	OUT.	52. Throttle	CLOSED.
42. Direction indicator.	CAGED.	53. Throttle lock.	As required.
43. Altimeter.	SET.	54. Air brake control.	OFF.
44. Power failure warning light.	ON.	55. Low-pressure cock.	ON.
		56. High-pressure cock.	OFF.

ITEM	CHECK	ITEM	CHECK
57. Emergency air release (under-carriage).	OFF Safety pin in position.	64. Controls.	Full and free movement. Correct sense.
58. Emergency air release. (Emergency air for wheel brakes).	OFF Safety pin in position	65. Brakes.	ON. Note.- No triple pressure gauge is fitted. Correct functioning of the differential brakes can be checked whilst taxiing.
59. Elevator trim.	Ease of movement. Correct sense. Correct indication. Full range.	66. Canopy.	Operation. Jettison toggle fully forward.
60. Anti-spin parachute control.	JETTISON.	AFTER STARTING ENGINE	
61. Mic/Tel sockets (2) (port side of seat at head rest).	PLUGGED IN.	67. Oil pressure	5 lb. per sq. in (min. idling r.p.m.)
62. Oxygen quick-release plug. (Starb'd side of pilot's seat).	PLUGGED IN.	68. Jet pipe temperature.	530 deg. C (max. idling r.p.m.)
63. Oxygen quick-release plug (on pilot's harness).	PLUGGED IN.	69. Fuel pressure.	5 lb. per sq. in. min.
		70. R. P. M.	3,500 ± 200 (idling r.p.m.) 8,000 to 9,000 (cool-est running r.p.m.)
		71. Vacuum	3½ to 5 in. Hg.
		72. H. P. cock	Fully ON.
		73. L. P. cock	Fully ON.

ITEM	CHECK
74. Ground supply.	Removed.
75. G/F switch.	FLIGHT.
76. Hydraulic pressure.	2,000 lb. per sq. in.
77. Air brakes.	Check operation.
78. Oil temperature.	Rising.
79. Power failure warning light.	OUT. 5,000-6,000 r.p.m.
80. Artificial horizon.	Erected.
81. Ammeter	Charge.
82. Auto-observer supply switch.	ON as required.
83. Radio supplies switch.	ON as required.

Note.- When the engine is idling, all unnecessary electrical loads should be switched OFF.

BEFORE TAXYING

84. Under-carriage jury struts.	Ensure removal.
85. Anti-spin parachute safety pins.	Ensure removal.
86. Pneumatic supply.	Note pressure.

ITEM	CHECK
87. Canopy.	Shut.
88. Ejector seat blind safety pin.	Remove and stow.
89. Airbrakes.	OFF
90. Radio.	ON as required.
91. Chocks.	Removed.

BEFORE TAKE-OFF

92. Elevator trim.	Neutral
93. Aileron trim.	Neutral
94. Throttle	Tighten as friction required.
95. H.P. cock.	Fully ON.
96. L.P. cock.	Fully ON.
97. Booster pump circuit breakers.	ON.
98. Air brakes.	OFF.
99. Canopy.	CLOSED.
100. Harness.	LOCKED.
101. Oil temperature.	-40 deg. C. min. +80 deg. C. max.
102. Direction indicator.	Set. UNCAGE.
103. Engine master switch	ON.
104. Auto-observer supplies.	ON as required.

ITEM	CHECK	ITEM	CHECK
105. Radio	ON as required.	123. Direction indicator.	CAGED.
106. Nose wheel.	CENTRAL.	AFTER STOPPING ENGINE	
107. Aircraft position.	Lined up on runway.	124. Throttle.	Closed.
108. Brakes.	ON.	125. H. P. cock.	Off.
109. Pressure head heaters.	ON.	126. L. P. cock	On.
BEFORE LANDING		127. Air brakes.	Off.
110. Pneumatic pressure	Sufficient for landing run.	128. Radio.	Off.
111. Brakes.	OFF.	129. Booster pump circuit breakers.	Off.
112. H. P. cock.	Fully ON.	130. Engine master switch.	Off.
113. L. P. cock.	Fully ON.	131. Pitot head heaters.	Off.
114. Fuel contents.	More than 50 gallons.	132. Auto-observer supplies.	Off.
115. Booster pumps.	ON	133. Oxygen regulator.	Off.
116. Under-carriage.	DOWN. (E. A. S. 166 knots, max.)	134. Camera switch.	Off.
117. Under-carriage indicators.	GREEN LIGHTS ON.	135. Ground/flight switch.	Ground.
118. Under-carriage door warning light.	ON	136. Head blind safety pin.	In position.
119. Air brakes.	As required.	137. Chocks.	In position.
AFTER LANDING		138. Brakes.	OFF.
120. Brake pressure.	Sufficient to taxi in.	139. Emergency air releases(3).	Off.
121. Air brakes.	OFF.	140. Pressure head covers.	On. (when pressure heads have cooled).
122. Pressure head heaters.	OFF.		

PART I

DESCRIPTIVE

INTRODUCTION

1. The Avro Type 707B is a jet-propelled experimental aircraft powered by one Derwent 5 turbine engine and is designed primarily for research into the control and stability characteristics of the swept-back wing aerofoil at low speeds.

FUEL AND OIL SYSTEMS

2. Fuel is carried in a single tank, with a capacity of 205 gallons, housed in the forward portion of the fuselage rear centre section.

3. Two electrically-operated booster pumps supply fuel from the tank to a high-pressure pump driven by the engine which increases the pressure before delivery to the engine combustion chambers. To prevent fuel failure during aerobatics, each fuel pump is mounted in an inverted flight valve compartment. An aneroid-operated barostat fitted in the delivery line of the high-pressure pump controls the fuel supply by regulating the pump as height is gained; the engine r.p.m., therefore, remain substantially constant at any selected throttle opening. From the engine-driven pump fuel passes to the throttle (fuel control valve) and the H.P. cock. A pressurizing valve is fitted in parallel with the throttle; this ensures that at altitude, regardless of the throttle setting, sufficient pressure will be maintained to prevent flame extinction providing the booster pumps are ON. When shutting down the engine an outlet to atmosphere drains any fuel present in the system.

Fuel contents gauges

4. A single fuel contents gauge, a burner pressure gauge and a low fuel level warning lamp, which illuminates when the tank contents fall below 50 gallons, are mounted on the starboard portion of the instrument panel. The instruments register when the aircraft master switch is placed to FLIGHT.

Fuel booster pumps

5. The fuel pumps are controlled by switches which are mounted together with test switches and ammeter on the starboard console. A fuel pressure gauge on the starboard portion of the instrument panel indicates the delivery of fuel from the booster pumps.

Fuel cocks

6. The low-pressure fuel cock is controlled by a lever mounted on the port side of the control box; it has two positions, marked OFF (down and back) and ON (forward and up). The high-pressure cock is controlled by a lever mounted on the control box which must be moved forward for fuel ON and back for fuel OFF. A re-light push-switch is mounted in the end of the latter lever

Oil system

7. An oil tank of 22 pints capacity is mounted on the wheelcase. Lubrication is of the dry-sump type with pressure feed to the main bearings, coupling and wheelcase jet. An oil pressure gauge is on the centre portion of the instrument panel.

MAIN SERVICES

Pneumatic system

8. A pneumatic system is provided to operate the wheel brakes and pressurize the hydraulic reservoir. No compressor is fitted, the system being charged to 2,750 lb. per sq. in. from a ground supply before flight. A single gauge on the port portion of the instrument panel indicates the pressure in the air container. No triple pressure gauge is fitted and a cockpit check of the differential braking pressure can only be made by application of the brakes during taxiing; external points are provided in the wheel bays for the attachment of pressure gauges.

9. Air pressure at 7 lb. per sq. in. is fed to the hydraulic system reservoir to provide an artificial head and thus prevent negative pressure occurring at the inlet side of the "live-line" hydraulic pump.

10. An engine-driven vacuum pump provides suction for the blind-flying instruments.

ELECTRICAL SYSTEM

11. An engine-driven generator charges two 12-volt batteries connected in series. These in turn supply the whole of the electrical services at 24 volts except the engine-starting system. A generator warning light, mounted at the top right-hand side of the instrument panel, indicates when the voltage of the generator falls appreciably below the voltage of the batteries. It is wired directly to the batteries and will,

PART I - DESCRIPTIVE

therefore, be on continuously when the engine is not running, irrespective of the position of the master switch.

12. A heavy duty master switch with GROUND and FLIGHT positions is fitted to the rear of the starboard console on the cockpit bulkhead. An external supply socket is fitted on the starboard side of the fuselage nose section.

13. When the master switch is set to GROUND the electrical services are isolated from the generator and aircraft batteries, except the V.H.F. radio and fire extinguishers which remain, at all times, connected to the aircraft batteries; the system can be connected through the external supply socket to a ground supply. When the master switch is set to FLIGHT all electrical services are connected to the aircraft batteries.

HYDRAULIC SYSTEM

14. Hydraulic pressure supplied by the engine driven "live-line" pump operates the alighting gear and is also stored in a pressurised accumulator to operate the wing air brakes.

15. Sufficient pressure will be available in the accumulator for one complete operation of the air brakes after failure of the engine driven pump. The alighting gear can be lowered by emergency air in the event of failure of the hydraulic system.

AIRCRAFT CONTROLS

Undercarriage controls

16. The undercarriage selector push switches are at the forward end of the throttle box and are marked UP and DOWN. To prevent inadvertent operation whilst on the ground, the push-switches are locked by a solenoid operated by micro-switches on the oleo strut torque linkages. The solenoid can, however, be over-ridden to permit UP selection, by applying a manual force of 40 pounds.

17. A standard undercarriage position indicator is fitted on the port side of the instrument panel. The indications are :-

Wheels locked UP No lights
Wheels between UP and DOWN Red lights
Wheels locked DOWN Green lights

18. Should the throttle be more than three quarters closed with the undercarriage in the UP position the undercarriage indicator red lights will flash intermittently. An additional red warning indicator will illuminate should either of the undercarriage doors be locked.

Air brakes control

19. The air brakes control lever on the port side of the cockpit has two positions, forward to CLOSE and to the rear for OPEN.

PART I - DESCRIPTIVE

Before selection can be made the spring loaded plunger in the lever handle must be depressed.

Flying Controls

20. The control column is a simple stick type and incorporates the brake lever and parking lock catch, the cine camera switch, gun firing switch (inoperative), and a spring-loaded PRESS-TO-SPEAK switch. Flying control locking gear is not provided, as the aircraft is normally housed in a hanger.

21. As fitted, the rudder is directly operated by the pilot and is provided with a geared tab, but it is so arranged that it can be converted to servo tab if required, using the same tab. A spring artificial feel box in the dorsal fin will then be used to simulate a normal sense of feel in the pilot's rudder pedals. Adjustment of the pedals can be made by turning a handwheel at the centre of the pedal assembly.

Elevator trim tab control

22. The elevator trim tab control wheel, with indicator, is on the port side of the cockpit engine control box.

Aileron trim tab control

23. A three position switch at the rear end of the port console controls the small trim tab inset in the port aileron. The switch is spring-loaded to the central "off" position and is marked RAISE RIGHT WING and RAISE LEFT WING. The indicator, showing the tab position is adjacent to the switch.

Aileron geared tabs

24. Both ailerons are equipped with geared tabs. One of three gear ratios can be selected by connecting the tab operating arm rod at one of three holes in the tab operating arm.

Yaw damping tab

25. A small tab located above the rudder geared tab is operated by an electric actuator. A rate gyro and amplifier are connected to the actuator. The whole system when operative applies the correct rudder movement to oppose any small yawing movement of the aircraft.

Wheel brakes

26. The brakes control lever and parking catch are on the control column. Differential control of the brakes is afforded by a relay valve connected to the rudder bar shaft.

PART I - DESCRIPTIVE

ENGINE CONTROLS

Throttle control

27. A throttle lever which moves in a quadrant marked SHUT-THROTTLE-OPEN extends from the engine control box. The lever is damped by a lever-operated friction adjuster.

28. A jet temperature gauge, a burner pressure gauge and a fuel pressure gauge are on the starboard portion of the instrument panel. The r.p.m. indicator is to the lower right of the centre portion of the instrument panel.

Engine-starting system

29. The electrical starter motor is energised from a ground starter trolley and controlled by the master switch and engine starting push-switch, both these components being mounted on the starboard console.

30. When the master switch, fuel cock switches and booster pump circuit breakers are closed the electrical circuits to the fuel tank pumps are completed. The fuel pressure warning indicator glows until a suitable pressure (at least 5 lb. per sq. in.) has been built up. The push-button should be depressed for about two seconds and then released to set into motion the timing clock mechanism which automatically operates the starting sequences, giving first a turning period sufficient for the attainment of the correct r.p.m. for the "light-up", and then a further period to accelerate the engine to idling r.p.m. before the starter motor cuts out. The engine can be started in the air, the re-light push-switch being mounted in the high-pressure fuel control lever.

OPERATIONAL CONTROLS

Radio equipment

31. The T.R.1520 normal and standby transmitter-receivers are installed in a crate behind the starboard side of the cockpit bulkhead. The four-position V.H.F. CONTROL is on the starboard console and the PRESS-TO-SPEAK push-switch is incorporated in the control column.

Other controls

32. Two switches for the pressure head heaters are on the starboard console.

PART I - DESCRIPTIVE

Canopy

33. The canopy is opened and closed by hand. A spring-loaded lever, which must be operated before the canopy can be moved, is situated on the cockpit port wall and locks the canopy in any desired position when released. The locking mechanism is equipped with an indicator flag to indicate to the pilot that the lock is fully engaged when the canopy is closed.

34. In flight, the canopy can be jettisoned by pulling the black and yellow striped handle on the starboard portion of the instrument panel. A CANOPY EXTERNAL RELEASE on the outside of the fuselage, port side, permits the canopy to be opened from the outside.

Cockpit heating and ventilation

35. Provision is made for cockpit heating and ventilating, using hot air from the engine compressor and cold air from an air intake in the starboard nose. Two spring-loaded levers, labelled ON - HOT AIR - OFF and ON - COLD AIR - OFF are on the cockpit floor adjacent to the starboard console. A guard between the two levers ensures that cold air is turned on first.

Oxygen system

36. An oxygen regulator Mk.11C is mounted below the centre of the instrument panel. Access to the charging valves is gained through the battery stowage compartment. The low-pressure side of the regulator is connected to the economiser, the outlet side of which is connected by tube to a quick-release plug and socket at the ejector seat.

Ejector seat

37. A Martin-Baker ejector seat is fitted, the head blind of which when pulled over the face acts as a trigger. The head blind is secured by a safety pin, to be removed by the pilot before take-off, and a sear safety pin to be removed by the ground personnel. Correct adjustment of the head rest to suit pilots' stature is essential.
Anti-spin parachute

38. The anti-spin parachute lever is at the left-hand edge of the control box.

39. Para. reserved.

40. Para. reserved.

PART 2

HANDLING

MANAGEMENT OF THE FUEL SYSTEM

41. The fuel system consists of a single fuselage tank with two booster pumps, a low-pressure cock at the engine firewall, and a high-pressure cock on the engine. The high and low pressure cock controls are on the port console and the engine master switch, booster pump circuit breakers and pump test switches on the starboard console. A fuel contents gauge, low fuel level warning lamp, fuel pressure gauge and burner pressure gauge are situated on the starboard instrument panel.

Testing the booster pumps

42. The fuel booster pumps should be tested before starting the engine. Use a fully-charged external battery when conducting this test.-

- (1) H.P. cock - OFF
- (2) L.P. cock - ON
- (3) Engine master switch - OFF
- (4) Booster pump circuit breakers - ON
- (5) Press one booster pump test button and note the test ammeter and pressure gauge readings
(7 amp. max.; 9 lb. per sq. in. min.).
- (6) Repeat item (5) for the other booster pump.

Low fuel level warning lamp

43. The low fuel level warning lamp lights when the fuel contents have fallen to approximately 50 gall., and a landing should be made as soon as possible.

PART 2 — HANDLING

STARTING THE ENGINE

44. After carrying out external, internal and cockpit check list items, proceed as follows.-

- (1) Ground starter battery Plugged in
- (2) Ground/flight switch GROUND
- (3) Chocks In position
- (4) Ground personnel Clear of jet efflux
- (5) Throttle FULLY CLOSED
- (6) H.P. cock OFF
- (7) L.P. cock ON
- (8) Engine master switch ON
- (9) Fuel booster pump circuit-breakers ... On
- (10) When fuel pressure rises, press the engine starter button for approximately 2 seconds.
- (11) After the engine has been turning for about 5 seconds slowly move the H.P. cock ON.
- (12) "Light up" will occur and the r.p.m. should begin to rise.
- (13) Run at idling r.p.m. for approximately 30 seconds as a warming-up period.
- (14) Carry out check list items 67 to 83.

Engine fails to start

45. Should the engine fail to start, the cause of failure must be investigated before a second attempt is made. A second attempt must not be made until fuel has ceased draining from the combustion chamber drains or an explosive start may occur.

PART 2 - HANDLING

Resonance

46. Should jet pipe resonance occur during a start, the jet pipe temperature will steadily rise. The temperature should be prevented from exceeding 600 deg.C. by stopping the engine.

GROUND TESTING

47. There are no definite ground checks, with the exception of a general run up from idling speed to maximum speed. The throttle should be opened gradually from idling speed with a pause at maximum cruising r.p.m. to note the instrument readings, and then increased to maximum r.p.m. which is controlled by the fuel pump governor. Note the readings and close the throttle slowly to idling speed and again note the readings. Do not run the engine on the ground longer than necessary, or the temperatures will become excessive. During accelerations the jet pipe temperature may momentarily exceed the maximum, but should drop to a normal figure when the r.p.m. has stabilised.

TAXYING

48. Before taxiing carry out check list items 84 to 91.

- (1) Turns of short radius should be avoided as they can cause undesirable stresses on the tyres and oleo legs.
- (2) The throttle should not be opened or closed rapidly as resonance and excessive jet pipe temperatures can result.

TAKE-OFF

49. Before take-off carry out check list items 92 to 109.

- (1) Line the aircraft with the runway.
- (2) Open throttle slowly to take-off r.p.m.
- (3) The rudder becomes effective at an early stage of the run and little use of the brakes should be necessary for keeping straight.

PART 2 - HANDLING

- (4) Raise the nose wheel AS SOON AS POSSIBLE (about 70 knots). The aircraft will unstick at about 100 knots.
- (5) When airborne, brake the wheels and retract the undercarriage. (There is a slight change of trim both nose up and nose down during undercarriage operation but this is easily controlled).

CLIMBING

50. Climb at maximum continuous r.p.m. The r.p.m. tend to increase with altitude; throttle back gradually to maintain constant r.p.m. The recommended climbing speed at sea level is 280 knots I.A.S. This speed should be reduced by 25 knots every 10,000 ft. At high altitude, engine surging may occur. It should be stopped by reducing engine r.p.m. or increasing the indicated airspeed.

GENERAL FLYING

51. The controls are powerful and effective throughout the speed range but tend to become very heavy at high speed. There is considerable inertia in the circuit and this has a detrimental effect on the impression obtained of handling the aircraft. (A check of the inertia effect can be made on the ground before take-off by moving the controls rapidly). The elevator trimmer is powerful and effective throughout the speed range and if moved to the extreme position in flight could cause stick forces which could not be controlled by the pilot. The air brakes are effective and only cause a slight change of trim. Operation is limited to 300 knots and an indicated Mach number of .72.

Flying at reduced airspeeds

52. The aircraft can be flown comfortably at 150 knots with the air brakes out.

Cruising

53. Rapid movement of the throttle above 15,000 ft. may result in the flame being extinguished or high jet pipe temperatures. Above 30,000 ft. any throttle movement must be carried out very carefully. If combustion ceases, close H.P. cock immediately.

PART 2 - HANDLING

Stalling

54. The aircraft is restricted to a minimum speed of 100 knots at which speed the elevator forces are beginning to reverse, that is, as speed is reduced an increasing push force will be required. At 110 knots aileron buffet is noticeable and for normal flight this should be regarded as the lowest speed desirable. There is an ample safety margin when flying at this speed as the aircraft has been flown down to as low as 80 knots.

Spinning

55. Spinning is prohibited. In the event of an accidental spin starting, the tail parachute should be released immediately.

Diving and high-speed flying

56. At the higher indicated speeds and Mach numbers, the aircraft becomes progressively more nose heavy. This is under investigation and is probably a control characteristic. The change of trim is slight at the speeds within the limitations imposed and can safely be trimmed out on the trimmer.

Aerobatics

57. All aerobatics except spinning may be performed. The engine will run under negative "g" for a maximum of 15 seconds if there is more than 60 gallons of fuel in the tank.

APPROACH AND LANDING

58. Carry out check list items 110 to 119.

- (1) Reduce speed to 150 knots with air brakes out.
- (2) Lower undercarriage and check indicators.
- (3) Approach at 130 knots with engine r.p.m. 7,000 or more to ensure quick opening up if required.
- (4) Make final approach at about 115 knots and a normal tricycle landing holding the nose wheel clear of the ground.

PART 2 - HANDLING

- (5) Although the incidence at touch down is high, it is not embarrassing to the pilot and in fact is not particularly noticeable. If the runway is in view over the nose, there will be no danger of touching the tail skid. At very low speeds there may be some reversal of stick forces and if this occurs, care should be taken not to increase the incidence violently enough to become airborne again after touch down.

Landing with use of tail parachute

59. Approach in exactly the same way as for a normal landing. When at 20 ft. or less above the ground and over the end of the runway, stream the parachute. There is a slight delay before development and a noticeable increase of drag occurs. There is no change of trim and even if the approach speed is considerably in excess of that desired, a short landing run will result. Care should be taken not to stream the parachute either when too high or before reaching the end of the runway.

MISLANDING AND GOING ROUND AGAIN

60. When landing it should be borne in mind that the thrust response is not so rapid as a piston engine. A decision to "go round again" must be made in good time.

STOPPING THE ENGINE

61. To stop the engine, proceed as follows.-

- (1) Close the throttle.
- (2) Close the H.P. cock.
- (3) Switch OFF the booster pump.
- (4) Switch OFF the engine master switch.
- (5) DO NOT close the L.P. cock unless the engine is stationary. In normal cases, the L.P. cock is left ON.
Note.- The time taken for the engine to run down varies with the number of accessories, but any undue friction will appreciably shorten the run down time.

AFTER STOPPING ENGINE

62. Carry out check list items 124 to 140.

FINAL CHECKS FOR TAKE-OFF

TRIM ...NEUTRAL

FUEL ...L.P. COCK ON
 H.P. COCK ON
 BOOSTER PUMPS ON

AIR BRAKES ...OFF

FINAL CHECKS FOR LANDING

BRAKES ...OFF. CHECK PRESSURE

WHEELS ...LOCKED DOWN

PART 3

LIMITATIONS

63. ENGINE DATA, DERWENT 5

CONDITION	R. P. M.	MAX JET PIPE TEMPERATURE	TIME LIMIT
TAKE-OFF	14,700 (max.)	710°C up to 20,000 ft. 730°C above 20,000 ft.	10 minutes
MAX. CONTINUOUS	14,100	660 deg. C	
IDLING UNRESTRICTED	3,500	530 deg. C	

OIL

PRESSURE		TEMPERATURE DEG. C
14,100 r.p.m.	30 lb. per sq. in. (min.)	+ 80 max. - 40 min.
3,500 r.p.m.	5 lb. per sq. in. (min.)	(for opening up)

FLYING LIMITATIONS

64. Spinning is prohibited.

The maximum permissible speeds are--

- (a) I.A.S. 400 knots
Mach No. *8
 - (b) With air brakes open
I.A.S. 300 knots
Mach No. *72
 - (c) Undercarriage down 170 knots
Undercarriage operation 150 knots.
- Note.- The Machmeter reads *04 low.

EMERGENCIES

PNEUMATIC FAILURE

65. If the pneumatic system storage bottles become exhausted through continued braking or leakage, the emergency air pressure can be fed to the brake system. An air release valve on the port side of the cockpit labelled EMERGENCY AIR FOR WHEEL BRAKES should be turned ON as follows :-

- (1) Remove the safety pin securing the lever.
- (2) Move the air release valve lever to the ON position.
- (3) Check that the pneumatic pressure gauge now indicates the same pressure as the emergency air pressure gauge.
- (4) Use brakes in the normal manner.

HYDRAULIC FAILURE

Undercarriage

66. In the event of a hydraulic failure the undercarriage may be lowered by emergency air. The position of the undercarriage selector is immaterial, but it is advisable to select DOWN as the hydraulic system may recommence functioning after landing. To lower the undercarriage by emergency air, proceed as follows :-

- (1) Remove the safety pin from the undercarriage emergency air release lever.
- (2) Move and hold lever in the ON position.
- (3) Check that the undercarriage locks down.
- (4) Release the lever.

ELECTRICAL FAILURE

67. Generator failure is indicated when the power failure warning lamp lights. Electrical services will continue to operate until the batteries become exhausted. All unnecessary electrical loads must be switched off and landing made as soon as possible. As the batteries become exhausted all electrical instruments, the engine booster pumps and the undercarriage selector cease to function.

PART 4 - EMERGENCIES

ENGINE FAILURE

Combustion failure

68. Should combustion cease above 25,000 ft. do not attempt to re-light. Between 15,000 ft. and 25,000 ft. one attempt to re-light the warm engine may be carried out, but this attempt must be made immediately combustion ceases. Below 15,000 ft. re-lighting may be carried out with a warm or cold engine. If combustion ceases, proceed as follows.-

- (1) Close the H.P. cock at once.
- (2) Throttle - $\frac{1}{3}$ open.
- (3) Windmilling R.P.M. 1,000 - 1,200 (airspeed low).
- (4) Press the re-light button in the H.P. cock lever.
- (5) After 5 seconds turn the H.P. cock ON.
- (6) When a sharp increase in R.P.M. is observed.- Release the re-light button and throttle back to 7,000 r.p.m. until the jet pipe temperature stabilizes.

Engine fails to re-light

69. Should the engine fail to re-light proceed as follows.-

- (1) If the engine fails to re-light after 30 secs. turn H.P. cock OFF.
- (2) Wait for one minute to allow the engine to drain.
- (3) Repeat the re-light drill at a lower altitude, and a wider throttle setting.

Engine failure

70. In the event of engine failure, proceed as follows.-

- (1) Turn the H.P. cock OFF.
- (2) Switch the booster pumps OFF.
- (3) Switch the engine master switch OFF.

Note.- Do not turn the L.F. cock OFF or the high pressure pump may be damaged.

PART 4 - EMERGENCIES

ENGINE FIRE IN FLIGHT

71. In the event of an engine fire in flight, proceed as follows.-

- (1) Turn the H.P. cock OFF.
- (2) Turn the L.P. cock OFF.
- (3) Turn the engine master switch OFF.
- (4) Turn the booster pumps OFF.
- (5) 15 seconds after closing H.P. cock, press the fire extinguisher button.

IMPORTANT...

Do not attempt to re-start the engine, as no fire extinguisher will be available if a further outbreak of fire occurs.

OXYGEN FAILURE

72. If the oxygen supply fails for any reason other than the accidental disconnection of the quick-release coupling on the pilot's mask tube, proceed as follows.-

- (1) Pull the emergency oxygen release knob on the starboard side of the seat bulkhead.
- (2) Reduce height immediately as the emergency supply will only last a few minutes.

CANOPY JETTISON

73. When it is required to jettison the canopy, pull the toggle type handle at the starboard lower edge of the instrument panel. The handle is identified by yellow and black stripes.

EMERGENCY EXIT USING EJECTOR SEAT

74. To carry out an emergency exit by ejector seat proceed as follows.-

- (1) Reduce speed as much as possible.
- (2) Jettison the hood.

PART 4 - EMERGENCIES

- (3) Place the feet on the seat foot rests keeping the knees close together.
- (4) Press the base of the spine against the seat and the head against the headrest.
- (5) If possible keep the control column in a vertical position.
- (6) Raise both hands above the head and grasp the firing handle.
- (7) Draw the handle sharply downwards to chest level keeping the elbows close to the body. The handle is attached to a blast protective canvas screen which is shaped to fit the face and prevent forward and sideways movement of the head. The final movement of the screen cocks and fires the gun: accidental operation is thus impossible. When leaving the aircraft all connections between the pilot and the aircraft are automatically severed and the emergency oxygen set is automatically turned on.
- (8) After ejection a static line attached to the aircraft actuates a small cartridge-operated device on the seat, which throws out a drogue stowed in the headrest. This stabilizes the seat and prevents rotation.
- (9) The pilot in his own time, relinquishes his hold of the screen handle, unfastens his safety harness, falls out of the seat and pulls his parachute rip cord in the normal manner.

ANTI-SPIN PARACHUTE

75. In the event of an uncontrollable spin occurring, a small parachute on the rear end of the fuselage can be streamed. The drag of the parachute has a stabilizing effect on the spinning aircraft thus assisting the pilot to recover control. After recovery, the parachute can be jettisoned.

Opening the parachute

76. To stream the anti-spin parachute push the control lever fully forward to the STREAM position and leave it there.

PART 4 — EMERGENCIES

Jettisoning the parachute

77. To jettison the anti-spin parachute, pull the control lever firmly back to the JETTISON position and the parachute will be released.

KEY TO FIG. 1

COCKPIT - PORT SIDE

1. Emergency air control.
2. Aileron trim tab control.
3. Elevator trim tab handwheel.
4. Wheel brakes emergency air cock.
5. High-pressure fuel control and re-light button.
6. Low-pressure fuel control.
7. Throttle.
8. Anti-spin parachute lever.
9. Canopy internal locking lever.
10. Air brakes control lever.
11. Throttle friction damper.
12. Observer camera controls.
13. Undercarriage controls.

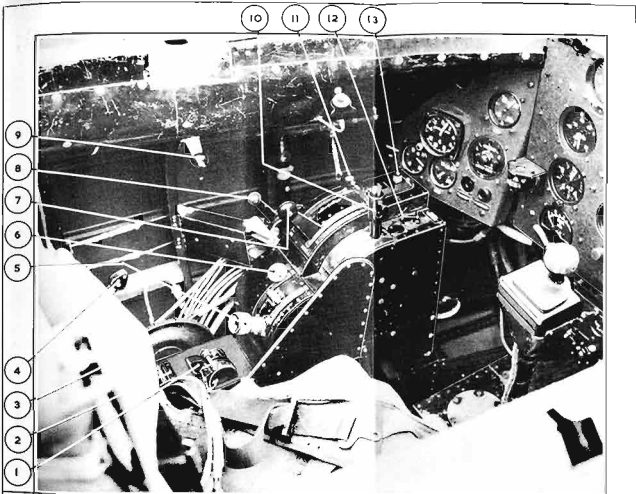


FIG
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FIG
1

KEY TO FIG. 2

COCKPIT — CENTRE

14. Undercarriage door indicators.
15. Hydraulic pressure gauge.
16. Emergency air pressure gauge.
17. Accelerometer.
18. Undercarriage indicator.
19. Pneumatic pressure gauge.
20. Type E2A compass.
21. Jet pipe temperature gauge.
22. Altimeter.
23. Air speed indicator.
24. Machmeter.
25. Artificial horizon.
26. Vacuum gauge.
27. Ammeter.
28. Rate-of-climb indicator.
29. Stick force gauge.
30. Fire extinguisher switch.
31. Burner pressure gauge.
32. Oil pressure gauge.
33. Air brakes position indicator.
34. Fuel pressure gauge.
35. Fuel low-level warning indicator.
36. Fuel contents gauge.
37. Camera film footage indicator.
38. Canopy jettison handle.
39. Turn-and-slip indicator switch.
40. Turn-and-slip indicator.
41. R.P.M. Indicator.
42. Direction indicator.
43. R.A.E. twin axis stick force transmitter.

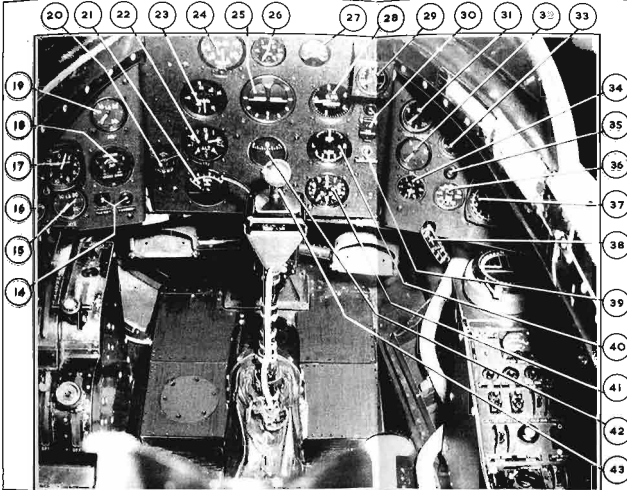


FIG
2

FIG
2

KEY TO FIG. 3

COCKPIT - STARBOARD SIDE

- 44. Engine starting switch.
- 45. Fuel pump switches.
- 46. Fuel pump test switches.
- 47. Dorsal fin camera switch.
- 48. P.11 compass.
- 49. Compass correction card.
- 50. Pressure head heater test switches.
- 51. Pressure head heater switches.
- 52. Cockpit altimeter.
- 53. Engine master switch.
- 54. V.H.F. radio controls.
- 55. Cabin heating controls.

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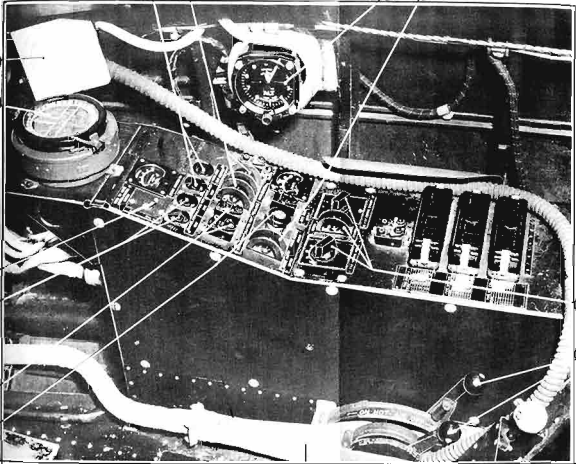


FIG 3

FIG 3

