PART II

HANDLING

NOTE.—All handling speeds quoted apply when the pressure head is positioned on the leading edge of the port fin.

27. **Management of the fuel system**

All three permanent tanks feed the engine when the cock lever below the throttle box is pushed forward to the FUEL ON position. In aircraft with two fuel cock levers, the second lever, outboard of the throttle lever, must also be in the ON position.

28. **Preliminaries**

On entering the cockpit check :

(i) MASTER SWITCH ... ... FLIGHT
All individual electrical services switches OFF
(ii) Undercarriage selector lever ... ... DOWN
Undercarriage position indicator lights ... Green
(iii) DIVE BRAKES control lever ... ... OFF
(iv) CANOPY SEAL control lever ... ... OFF
Pressurising lever ... ... OFF
(v) the contents of the fuel tanks.
(vi) the flying and trimming tab controls for full and free movement, and the rudder pedals for equal adjustment.
(vii) the operation of the hydraulic handpump by lowering and raising the flaps ; return the selector lever to neutral

29. **Starting the engine** (see para. 17)

NOTE.—(*a*) Any attempt to start with the MASTER SWITCH at GROUND will damage the starter equipment : this will be accentuated if, after commencing the starting sequence, the MASTER SWITCH is then changed to FLIGHT.

(*b*) Before starting the engine, check that the air intake guards are in position, that the aircraft is facing into wind and that nothing behind it will be damaged by the "wake" of the jet, the danger length of which extends for more than 100 yards.

(i) Have a 200 ampere-hour, 24 volt ground starter battery plugged into the starboard socket.

(ii) Ensure that the throttle lever is fully closed.

(iii) Set the fuel cock lever(s) to FUEL ON.

(iv) Switch ON the interlinked STARTER MASTER switches and press the engine starting pushbutton releasing it after two seconds.

(v) The engine should start and r.p.m. should increase gradually to the idling setting (2,800-3,200) without further attention.

(vi) When the engine is running steadily at 3,000 ± 200 r.p.m. switch OFF the interlinked STARTER and MASTER switches.

(vii) Switch ON the booster pump (if fitted).

(viii) Before taxying, check all temperatures and pressures and the operation of the engine-driven hydraulic pump by opening and closing the dive brakes. Ensure that the generator is charging the accumulators by noting that the power failing warning light is out, then have the air intake guards removed.

(ix) Switch ON the R.I. compass.

NOTE.—Do not run up the engine. This is unnecessary and wastes fuel.

30. **Taxying**

(i) The nose wheel can swivel freely through 360° and it is easy to make turns of such short radius that the inside main wheel remains stationary.

This practice must always be avoided since it causes undesirable stresses on the tyres and oleo legs.

(ii) The throttle must not be opened rapidly or excessive jet pipe temperatures will result.

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Para. 31

Check list before take-off

T—Trim Elevators ...	...	At typical Service load (full ammunition, full internal fuel)
		Goblin I: 8,616 lb. Neutral
		Goblin II: 8,700 lb. Neutral
F—Fuel	...	Cock lever(s) FUEL ON Booster pump ON (if fitted)
F—Flaps	...	UP (30° down for shortest run)
Dive brakes control lever	...	OFF
Sliding hood ...	...	Closed and securely locked (see para. 21(ii))
Pneumatic pressure	...	Early aircraft 200 lb./sq. in. Later aircraft 450 lb./sq. in.
Brake pressure ...	...	Early aircraft 90 lb./sq. in. Later aircraft 120 lb./sq. in. (See para. 6(i))

32. **Take-off**

(i) Align the aircraft carefully on the runway, making certain that the nose wheel is straight.

(ii) Open the throttle slowly to full take-off r.p.m. against the brakes ; check all engine instruments and, if the temperatures and pressures are satisfactory, release the brakes.

(iii) Keep straight initially by gentle use of the brakes, then, as speed is gained, by coarse use of the rudders.

(iv) As soon as the aircraft reaches a speed of 70—80 m.p.h. (60—70 knots) I.A.S. lift the nose wheel just clear of the ground, then at 95—100 m.p.h. (82—87 knots) I.A.S. ease the aircraft off the ground.

(v) When comfortably airborne brake the wheels and retract the undercarriage.

NOTE.—If the solenoid lock sticks and prevents the selector lever from being raised it can be overridden by operating the U/C EMCY. RETRACTION switch on the top left-hand side of the instrument panel.

(vi) Raise the flaps (if used) as soon as the undercarriage is fully up.

(vii) Set the CANOPY SEAL control lever to ON.

33. **Climbing**

The recommended speeds, for maximum rate of climb in m.p.h. (knots) I.A.S. are :

	GOBLIN I	GOBLIN II
From sea level to 5,000 ft. ...	250 (220)	260 (226)

reducing speed by 2 m.p.h. (knots) I.A.S. every 1,000 ft. thereafter.

NOTE.—(*a*) The temptation to climb at a speed comparable to that recommended for any contemporary propeller-driven single-seat fighter must be resisted since the efficiency of the jet engine is poor at low airspeeds.

(*b*) Providing the following modifications have been incorporated the aircraft may be flown up to a height of 35,000 feet ; otherwise, it is restricted to 20,000 feet.

(i) For aircraft with Goblin I Engine and no pressure cabin.

Vampire Mod. 9.
,, ,, PP9 (or PP3, Goblin 129, P21 and Goblin 187).
Goblin Mod. 50.
,, ,, 94.
,, ,, 136.

(ii) For aircraft with the Goblin II engine and no pressure cabin :

Vampire Mod. 9.
,, ,, PP16 (or PP3, Goblin 129, PP21 and Goblin 187).
Goblin Mod. 94.
,, ,, 136.

(iii) For aircraft with Goblin II engine and pressure cabin :

Vampire Mod. 9.
,, ,, 258.
,, ,, PP16 (or PP3, Goblin 129, PP21 and Goblin 187).
Goblin Mod. 94.
,, ,, 136.

34. **General flying**

(i) *Stability*

When a 13 lb. inertia weight is fitted in the elevator control circuit, longitudinal stability is reasonably satisfactory at low and moderate altitudes.

NOTE.—The carriage of a full ammunition load improves stability and does not entail an appreciable loss of performance.

Although stable directionally, the aircraft is prone to "snaking" in bumpy conditions, especially at high speeds.

(ii) *Changes of trim*

Undercarriage down ...	... Slightly nose up
Undercarriage up ...	... Slightly nose down
Flaps down	... Nose down
Flaps up	... Nose up
Dive brakes open (ON) ...	... Slightly nose up
Dive brakes closed (OFF)	... Slightly nose down

(iii) *Controls*

Both the elevator and the elevator trimming tab are light and powerful and must be used with care.

(iv) *Throttle manipulation*

The throttle should normally be operated very slowly to avoid high temperatures and surging. In emergency, however, at low altitudes, as in the case of a baulked landing the throttle may be opened rapidly.

(v) *Flying at reduced airspeed in conditions of poor visibility*

Reduce speed to below 170 m.p.h. (148 knots) I.A.S. using the dive brakes as required, then lower the flaps 30° and fly at 130 m.p.h. (114 knots) I.A.S.

35. **Stalling**

(i) The stalling speeds (engine off) in m.p.h. (knots) I.A.S. are :

	At typical service load (Full ammunition, full internal fuel)	
	Goblin I 8,616 lb.	Goblin II 8,700 lb.
Undercarriage and flaps up	95 (83)	102 (88)
Undercarriage and flaps down	78-80 (68-70)	85 (72)

(ii) With the undercarriage and flaps up, warning of the approach of a stall is given by faint tail buffeting, the onset of which can be felt at a speed some 20 m.p.h. (17 knots) I.A.S. before the stall itself. At the stall the tail buffeting is more pronounced, the nose drops gently, the A.S.I. needle may fluctuate widely and some aileron snatching may be felt. If the control column is held back, the snatching of the ailerons is more marked and either wing will drop.

(iii) With the undercarriage and flaps down, warning of the approach of a stall is again given by faint tail buffeting. Snatching of the ailerons is pronounced and either wing drops sharply. The wing drop can be checked by coarse use of the rudders and ailerons.

(iv) *High speed stall*

Ample warning of the approach of a stall in a steep turn is given by elevator buffeting. When this warning is observed the acceleration should be reduced since further backward movement of the control column can cause the aircraft to " flick " on to its back.

NOTE.—Turns steep enough to cause aileron snatching may overstress the ailerons.

36. **Diving**

(i) The aircraft becomes increasingly tail heavy as speed is gained and should, therefore, be trimmed into the dive.

(ii) The dive brakes are effective but promote considerable buffeting.

(iii) The elevator is light and powerful and must be used carefully during the recovery to avoid the imposition of excessive accelerations.

(iv) At speeds very little in excess of the maximum permissible speeds quoted in para. 44 (ii) (which represent a Machmeter reading of 0.75) considerable porpoising is encountered. The mean change of trim during porpoising is nose up : but warning of the onset of porpoising is given by a mild nose-down change of trim, which may be experienced shortly before the limiting speed is reached (i.e. at Mach. Nos. of 0.72—0.75) when the speed should not be allowed to increase further. The limiting speed should never be exceeded intentionally.

37. **Aerobatics**

(i) The following minimum speeds in m.p.h. (knots) I.A.S. are recommended :

Roll	260 (226)
Loop	380 (330)
Half roll off the top of a loop ...	400 (345)
Climbing roll	400 (345)

(ii) A large amount of height may be lost or gained in manoeuvres in the looping plane and an ample margin must be allowed for recovery.

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38. **Check list before landing**

Use the dive brakes to reduce speed to 200 m.p.h. (174 knots) I.A.S., then check :

U—Undercarriage down	Check indicator and warning light
CANOPY SEAL control lever ...	OFF

and, when speed has fallen below 170 m.p.h. (148 knots) I.A.S. check :

F—Flaps	Dive brakes closed (OFF) Flaps 30° down, fully down on the final approach
Pneumatic pressure	Early aircraft 200 lb./sq. in. Later aircraft 450 lb./sq. in.
Brake pressure	Early aircraft 90 lb./sq. in. Later aircraft 120 lb./sq. in. (see para. 6 (i))

39. **Approach and landing**

(i) At a weight of 7,808 lb. (full ammunition, half fuel remaining) the recommended final* approach speeds in m.p.h. (knots) I.A.S. are :

Flaps down	...	...	100 (87)
Flaps up	...	...	120—125 (104—108)

* This is the speed at which the airfield boundary is crossed.

NOTE.—(*a*) Except in the case of a " flapless " landing, the initial straight approach should be made at a speed some 20—25 m.p.h. (18—22 knots) I.A.S. above these figures.

(*b*) If it is necessary to make a " flapless " approach it should be low and fairly flat.

(ii) The response to throttle manipulation is not so prompt as on a propeller-driven aircraft and early corrective action must be taken if there is any tendency to under-shooting ; similarly, when the throttle is closed, deceleration is slow owing to the absence of propeller drag.

(iii) Make a normal tricycle landing, holding the nose-wheel well clear of the ground. Do not apply the brakes until the nose-wheel has settled firmly on the ground.

40. **Mislanding**

The aircraft will climb away easily with the under-carriage and flaps down.

(i) Open the throttle slowly to full take-off r.p.m. (See para. 34 (iv.))

(ii) Raise the undercarriage and climb initially at about 120 m.p.h. (105 knots) I.A.S.

(iii) As soon as the undercarriage is fully up raise the flaps, then increase speed to 180 m.p.h. (156 knots) I.A.S.

41. Beam approach

	Preliminary Approach	Inner Marker on Q.D.R.	Outer Marker on Q.D.R.	Outer Marker on Q.D.M.	Inner Marker on Q.D.M.
Indicated height (feet)	Down to 1,000	1,000	1,000	7-800	100
Action ...	—	Lower undercarriage	Lower ½ flap	Lower flaps fully	Throttle back slowly
Resultant ... change of trim	All changes of trim are slight and can be held without retrimming				
I.A.S. ...	170	150	130	115	100
R.P.M. (level flight)	6,000	7,000	7,000	8,000	
R.P.M. (—500 ft./min). ...	5,000	6,000	6,000	7,000	
R.P.M. (overshoot)					10,000
Altimeter error at take-off Altimeter error at touch-down } Negligible				*Overshoot* Open the throttle fully. Raise the undercarriage and climb initially at 110 I.A.S. raising the flaps when the undercarriage is locked up.	

42. After landing

(i) Before taxying raise the flaps.

(ii) On reaching dispersal :

Close the throttle fully.

Set the fuel cock lever to FUEL OFF (on aircraft with two levers, only the high pressure cock should be turned off).

Switch the booster pumps OFF (if fitted).

Switch off all the electrical services individually.

Set the MASTER SWITCH to GROUND.

See that the air intake guards are placed in position.