PART II
HANDLING

30. Management of the fuel system

(i) The internal and wing drop tanks all feed the engine, when the low and high pressure fuel cocks are in the ON position.

(ii) The booster pump should be switched on for starting and left on at all times when the engine is running.

31. Starting the engine

A.L.3 Para. 31 (i)

(i) After carrying out the external, internal and cockpit checks detailed in the Pilot's Check List, confirm :—

Master switch	FLIGHT
Throttle	Fully closed or *1" open
Low-pressure fuel cock ...	On
High-pressure fuel cock ...	On
Booster pump	On (fuel pressure warning light out).

*When Mod. 921 is incorporated. The throttle should be closed as soon as idling r.p.m. have been attained.

(ii) Have a 230 ampere-hour, 24-volt ground starter battery plugged in and switched on. It is essential that the starter battery be fully charged ; otherwise, it will not accelerate the engine to idling speed after " light up."

(iii) Switch in the interlinked starter-master switches and press the engine starting pushbutton, releasing it after two seconds.

A.L.3 Para. 31 (iv)

(iv) As soon as the burners light up, indicated by a flick of the burner pressure gauge needle and a rise in the jet pipe temperature, switch on the auxiliary starting switch, if necessary. The engine r.p.m. should then accelerate to the idling setting (3,000±200), the throttle should then be closed if previously opened.

(v) When the engine is running steadily at the idling setting, check that the jet pipe temperature settles down to not more than 600°C. Have the ground starter battery switched off and disconnected, switch off the interlinked starter master switches and if applicable the auxiliary starting switch.

(vi) If the burners fail to light up or the r.p.m. do not accelerate to the idling setting, the engine should be shut down as follows :—

(a) Close the high-pressure fuel cock. (If the cock is not in the fully closed position, fuel will leak past the starter valve, giving insufficient pressure for the next start.)

(b) Switch off the auxiliary starter switch, if applicable.

(c) Switch off the interlinked starter-master switches.

(d) Have the ground crew remove any surplus fuel from the jet pipe. A wait of at least four minutes or until the impeller stops turning, whichever is the longer, must follow before a second attempt is made. Should the engine fail to start at the second attempt, it must be shut down and the cause investigated.

(vii) If the aircraft is facing into a high wind, difficulty may be experienced in starting.

(viii) While idling the engine, carry out the checks detailed in the Pilot's Check List, items 93 to 100.

32. Taxying

(i) Before taxying, carry out the checks detailed in the Pilot's Check List, items 101 and 102.

(ii) Turns of short radius should be avoided as they may cause undesirable stresses on the tyres and oleo legs ; sudden application of brake in such a turn may also cause the nose wheel fairing door to strike the nose wheel.

(iii) Rapid and unnecessarily frequent opening and closing of the throttle should be avoided or engine surging and excessive jet pipe temperatures may result.

33. Take-off

(i) Carry out the checks detailed in the Pilot's Check List, items 103 to 110.

(ii) Taxy forward a few yards to straighten the nose wheel and open the throttle smoothly to take-off r.p.m.

NOTE.—(a) When carrying external stores or when conditions make the use of the shortest take-off run essential, the brakes should be applied when the aircraft is aligned on the runway

and the throttle opened slowly to take-off r.p.m. Then release the brakes.

(b) If for any reason it is necessary to check any of the engine instruments, this should be done against the brakes prior to take-off.

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

(iv) Ease the nose wheel off the ground at 70-75 knots (a fairly strong pull force will be necessary when carrying two wing drop tanks). Care must be taken not to get the nose wheel too high or the booms may touch the ground. The aircraft should be flown off at about 95 knots, 100 knots when at maximum all-up weight.

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

(vi) (a) When carrying wing drop tanks the airflow at high speed may prevent the undercarriage doors closing; the undercarriage should, therefore, be retracted as soon as the aircraft is comfortably airborne and before a speed of about 130 knots is attained. If the indications show that the undercarriage is not fully retracted, gentle yawing and/or use of the handpump at about 130 knots should succeed in locking it up. If this is unsuccessful climb to a safe height, keeping the speed below 175 knots and select undercarriage down ; then reduce speed as far as is practicable and reselect undercarriage up.

(b) If the solenoid lock sticks and prevents the selector lever from being raised, it can be overridden by operating the undercarriage emergency retraction switch.

(vii) Raise the flaps and turn on the canopy seal.

(viii) (a) Before a catapult take-off the pilot should check the following, in addition to the normal items shown in the Pilot's Check List.

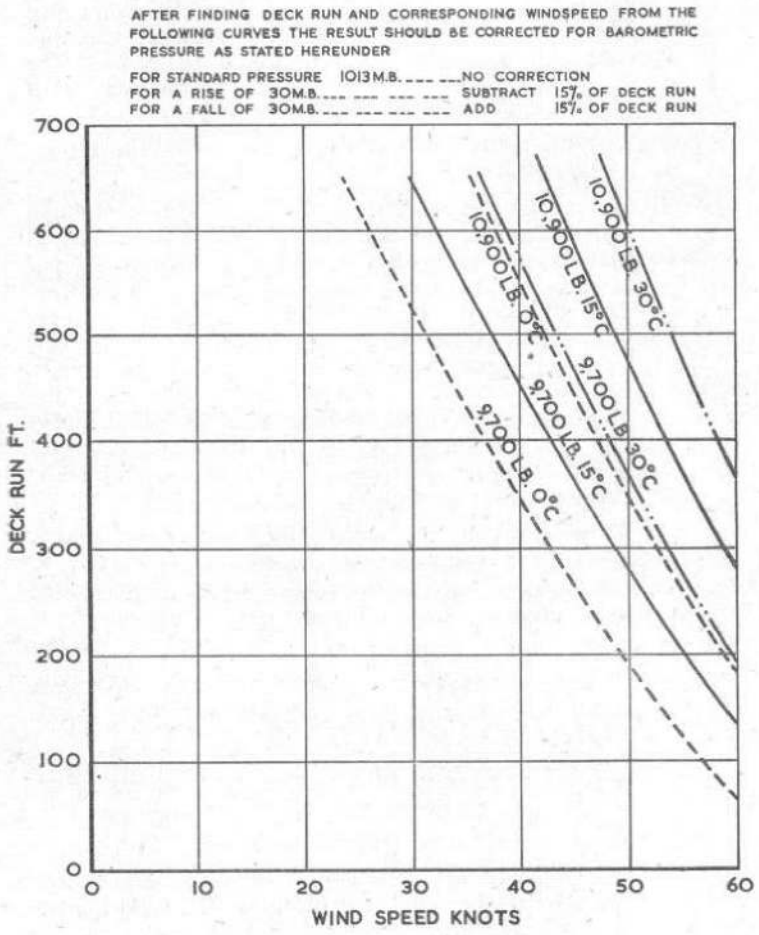
Main oleo pressure	...	...	350 lb./sq. in.
Main tyre pressure	...	...	86 lb./sq. in.
Nose oleo pressure	...	...	500 lb./sq. in.
Nose tyre pressure	...	...	75 lb./sq. in.

(b) For a catapult take-off use 45° flap and neutral elevator trim. The control should be held central with the right arm held firmly braced against the hip

SEA VAMPIRE 20

1 X GOBLIN 2 (3000 LB. S.T.)

VARIATION OF DECK RUN WITH ATMOSPHERIC TEMPERATURE AND PRESSURE



joint as there is a tendency for the control column to move back during the launch. Should the control column move back despite this braced position, the nose wheel will be raised from the deck ; as the aircraft leaves the catapult the stick should be eased forward to reduce any excessive angle of attack thus imparted during the launch.

(ix) For carrier take-off use 30° flap and open the throttle to 10,200 r.p.m. against the brakes.
The UNASSISTED TAKE-OFF CURVES show the minimum winds speed required in knots over the flight deck which will allow a safe unassisted take-off at weights of 9,700 and 10,900 lb.

34. Climbing

(i) The speeds for maximum rate of climb at 10,200 r.p.m. are 260 knots at sea level decreasing by about 15 knots for every 10,000 ft. increase in altitude up to 30,000 ft. Above 30,000 ft. decrease speed by about 45 knots for every 10,000 ft. increase in altitude. With external stores slightly lower speeds should be used.

(ii) If for any reason maximum power cannot be used without exceeding jet pipe temperature limits, the r.p.m. should be reduced accordingly.

(iii) During the climb the cockpit pressure warning light will come on at approximately 17,000 ft. The cockpit pressurising lever should then be turned on and the warning light should go out. If desired, the pressurising lever can be turned on after take-off. If above 17,000 ft. the cockpit pressurising system fails, indicated by the cockpit altimeter reading the same as the aircraft altimeter and/or the warning light coming on, the climb should not be continued above 35,000 ft.

35. General flying

(i) At all loads stability is satisfactory at all altitudes and in all conditions of flight, except that when carrying wing drop tanks, or flying without ammunition longitudinal stability is slightly decreased and there is a tendency to tighten in turns at high altitude.

(ii) Changes of trim.
Operation of the flaps and undercarriage in either direction, promotes little change of trim, but on lowering the

flaps there is a progressive forward movement of the stick for a constant attitude of the aircraft.
Opening the dive brakes produces marked buffeting and a slight nose up change of trim. At high speeds, when carrying wing drop tanks, buffeting is less marked but the nose up change of trim becomes violent.

(iii) Controls.

All controls are light and well harmonised. The elevator is powerful and effective throughout the speed range ; the ailerons become less effective at low speeds and the rudder is the least powerful of the three main controls. The elevator trim is only moderately effective at low speeds but becomes powerful and sensitive at high speeds.

(iv) Flying at reduced airspeeds.

Close the dive brakes to reduce speed to 155 knots, lower 30° of flap and close the air brakes. Fly at about 140 knots.

(v) Throttle manipulation.

Movement of the throttle should be made slowly to avoid engine surging and high jet pipe temperatures. Engine response to throttle opening is slow below 7,500 r.p.m. In an emergency the throttle may be opened rapidly.

A.L.3 Para. 35 (vi)

(vi) *Flight in turbulent conditions*
Speed in conditions of severe turbulence is 220 knots.

36. Flight planning charts

(i) The following flight planning charts for the aircraft, with and without drop tanks and external stores, show the range obtainable at various altitudes as well as the quantity of fuel remaining in the tanks, the time taken and the distance covered from the take-off at any stage of the flight. Charts 1 and 2 are optimum range charts and give the recommended level flight I.A.S. Chart 3 shows the range and other corresponding data obtained when flying without external stores at a higher over-all speed, the level flight stage being carried out at maximum continuous r.p.m. and increasing I.A.S. as fuel is used. In this case approximate mean cruising I.A.S. is shown against each curve. These charts illustrate the advantage of flying at a high altitude.

NO EXTERNAL STORES

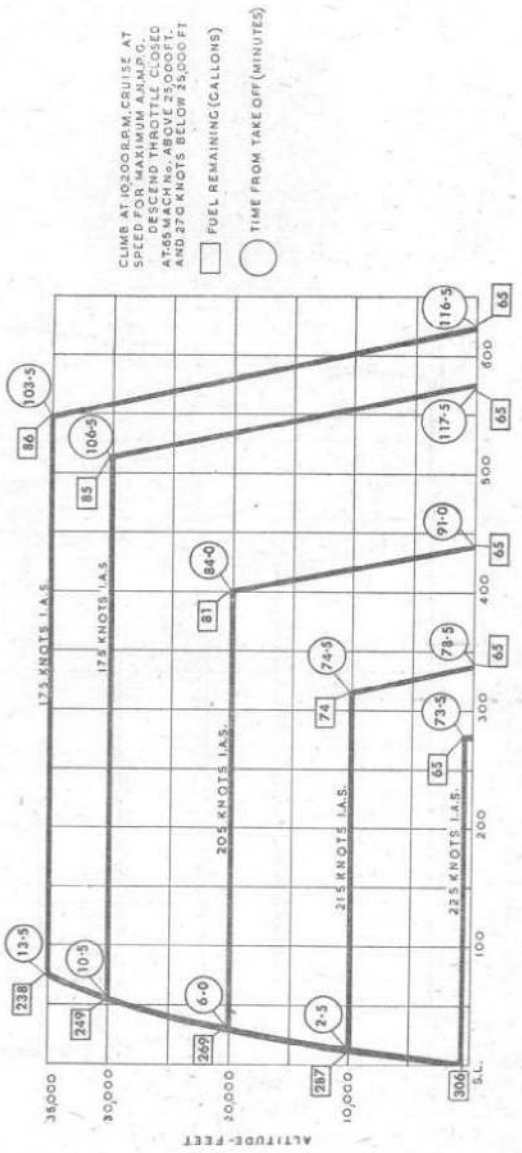


CHART 1

2X100 GALLON DROP TANKS

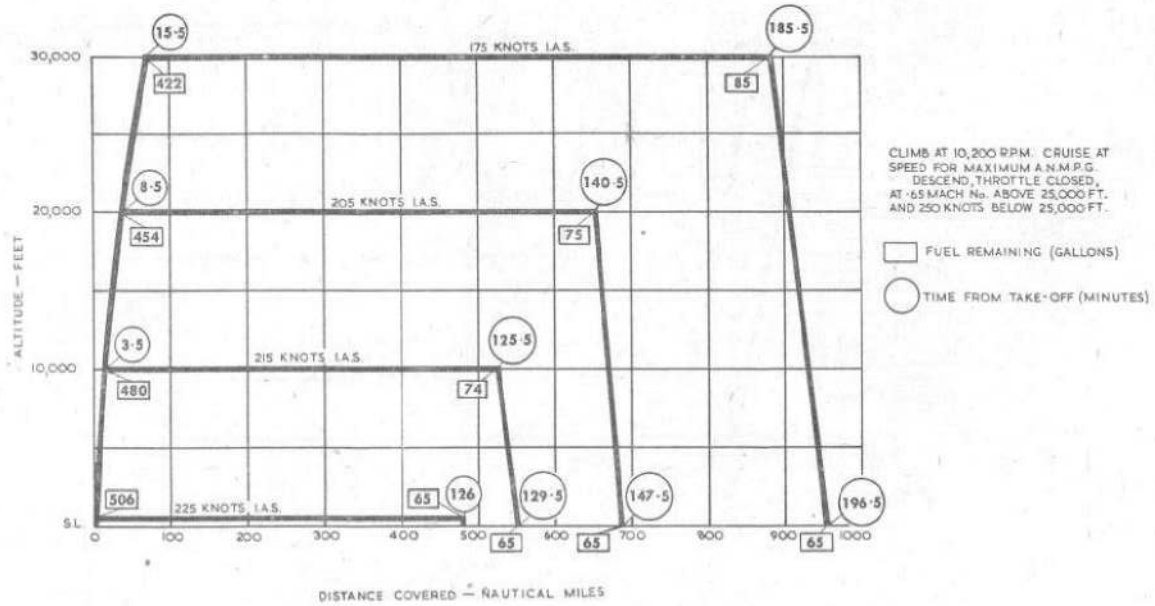


CHART 2

NO EXTERNAL STORES
(CRUISING AT MAXIMUM CONTINUOUS R.P.M.)

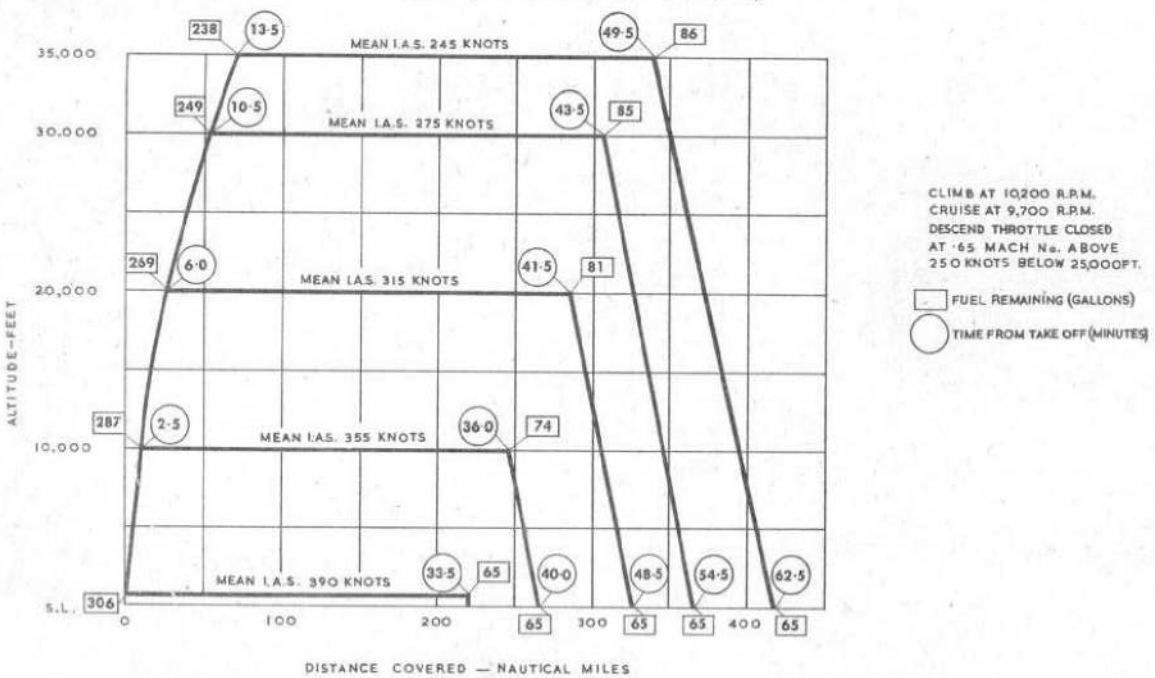


CHART 3

(ii) The following table shows the allowances made in the charts and how the fuel is used for each stage of the flight.

Taxying and take-off ...	24 gallons
In flight	241 (441) gallons
Landing 30	65 gallons
Unavailable 35	
Total	330 (530) gallons

NOTE.—(a) The figures in brackets apply with 2 × 100 gallon wing drop tanks.

(b) Pending the introduction of modified wing tanks the 35 gallons shown above as unavailable should be deducted from the total of the wing tank gauge readings to ascertain at any time the total available quantity of fuel remaining, because the construction of the wing tanks prevents the final 35 gallons draining from them to the fuselage tank at all but very low angles of attack. Provided, however, a minimum of 30 gallons is indicated by the fuselage tank gauge on joining the circuit, ample fuel will be available for going round again if necessary and completing the landing.

37. **Position error correction**

From 140 to 440 knots, the error increases gradually from 1 to 7 knots.

38. **High altitude flying.**

(i) At 35,000 ft., at all loads, stability remains satisfactory but harsh use of the rudder causes a marked wallowing effect.

(ii) Stick forces are light, making it easy to stall the aircraft in a turn. There is a tendency to tighten in turns when carrying wing drop tanks and/or when flying without ammunition.

(iii) The minimum pressure valve in the fuel system is barometrically operated. It will insure that the burner pressure does not fall too low to support combustion at high altitudes providing the booster pump is on. Thus, regardless of throttle setting a certain minimum r.p.m. will be obtainable. The minimum r.p.m. will increase with altitude

and should be approximately 8,000 at 35,000 feet. If engine surging is experienced at high r.p.m. the engine should be throttled back until it ceases.

(iv) Should the fuel pressure warning light come on above 20,000 ft., height should be reduced below this altitude as quickly as possible. Below 20,000 ft. the booster pump is not essential to maintain adequate fuel pressure to the engine and flight may be continued safely.

(v) If a rapid descent is anticipated, it is advisable to use the dive brakes. An adequate amount of fuel should be left for the descent and landing, see para. 36, flight planning charts, as the windscreen may become iced-up on descending and it may be necessary to allow time for de-icing or de-misting.

39. **Diving and high speed flying**

(i) The aircraft becomes progressively tail heavy as speed is increased up to 415 knots but above this speed up to the maximum permissible I.A.S. the stick force lightens considerably.

(ii) The elevator is light and powerful and should be used with care during a recovery.

(iii) Compressibility characteristics may vary between different aircraft but no difficulty in control should be experienced if the limitations are not exceeded.

(iv) The indications of the onset of compressibility effects vary with altitude but warning should be given by one or more of the following :—

(a) *At high altitude* (i.e., with a high indicated mach number at a relatively low I.A.S).
A progressive nose up change of trim from a mach number of .71 to .76.
Above .76 a backward movement of the stick for a constant angle of dive.
Lateral buffeting and very light aileron forces with a tendency for a wing to drop.

(b) *At low altitudes* (i.e., with a high indicated mach number and high I.A.S.).
The nose up change of trim is not so pronounced as at high altitude and lateral buffeting and a tendency for a wing to drop are the first warnings to occur, together with very light aileron forces, at a mach

number of about .77. These effects tend to mask the backward movement of the control column which will recur at about .78.

(v) At mach numbers of about .8 to .81 the aircraft will break away in a series of sharp pitching oscillations in an upward or downward direction.

(vi) When carrying wing drop tanks the aircraft remains unaffected up to the limiting mach number, in this condition, of .65. Above this figure lateral buffeting increases progressively.

(vii) Recovery from compressibility is almost immediate on opening the air brakes and/or throttling back. Use of the air brakes promotes considerable buffeting and a slight nose up change of trim.
When carrying wing drop tanks the nose up change of trim is violent.

(viii) It is recommended that the elevator trimmer should not be used to counteract the trim changes described in (iv) (a) as it may suddenly become effective in reducing speed and impose excessive loadings.

40. **Stalling**

(i) The approximate stalling speeds in knots are :—

Undercarriage and flaps up ...	90-95 knots
Undercarriage and flaps down ...	80 knots

The stalling speed in the clean condition is not very well defined as the A.S.I. fluctuates before the aircraft stalls. The use of medium power reduces the stalling speed by 2 to 3 knots.

(ii) When carrying external stores the stalling speeds are increased by 5 to 10 knots.

(iii) The stalling characteristics are similar for all loads.

(a) With the undercarriage and flaps up, warning of the approach of a stall is given by a slight elevator buffeting some 20 knots before it occurs, becoming more pronounced as the stall is approached. At the stall the nose drops and the A.S.I. fluctuates widely. If the control column is held back, there is pronounced longitudinal pitching and a tendency for either wing to drop. With power on there is less warning of the stall but an increased tendency for either wing to drop.

(b) With the undercarriage and flaps down, there is general airframe vibration at all times but some warning is given by slight buffeting which commences about 15 knots before the stall. At the stall there is pronounced buffeting, the nose and either wing may drop sharply and the A.S.I. fluctuates widely. Continued backward pressure on the control column results in stronger buffeting and an increased tendency for either wing to drop. With power on, there is less warning of the approach of the stall but the characteristics are unaffected.

(c) The air brakes do not noticeably affect the stalling speeds or characteristics.

(iv) At all loads, warning of the approach of a stall in a steep turn or in recovery from a dive is given by elevator buffeting and at the stall the aircraft may flick in either direction. Stick forces are light and it is relatively easy to stall the aircraft at low speeds in a steep turn, particularly at high altitudes with loadings near the aft C.G. limit.

(v) Recovery in all cases is normal and immediate.

41. **Aerobatics**

(i) The following speeds in knots are recommended :—

Roll	230-250
Loop	300-320
Half roll off loop	320-340
Climbing roll	340 plus

(ii) Aerobatics are prohibited when carrying wing drop tanks (either full or empty).

(iii) In manœuvres in the looping plane stick forces are light. Much height may be lost or gained and an ample margin should be always allowed for recovery to normal flight. Use of the air brakes on the top of a loop considerably reduces the height needed to recover.

(iv) The negative " g " valves in the fuel collector box ensure a supply of fuel for not more than 10 seconds inverted flight.

42. **Approach and landing**

(i) Carry out the checks detailed in Pilot's Check List, items 111 to 119.

(ii) At the maximum airfield landing weight 10,900 lb. (with or without external stores) the recommended final approach speed with full flap is 95 knots, at lighter weight 90 knots is recommended.

(iii) The initial approach should be made 15-20 knots above these figures.

(iv) It is recommended that a powered approach be made, especially when landing with external stores in order to obtain a better engine response in the event of having to go round again.

(v) Make a normal tricycle landing holding the nose wheel clear of the ground.

43. **Deck landing**

(i) The recommended approach speed is 90-95 knots.

(ii) Engine r.p.m. of about 8,000 will be required on the approach to maintain a constant height with undercarriage and flaps down.

44. **Mislanding and going round again**

(i) Always use full power.

(ii) Open the throttle slowly to take-off r.p.m. Raise the undercarriage as soon as possible and retrim.

(iii) Climb initially at 115 knots increasing to about 140.

(iv) Raise the flaps.

45. **After landing**

(i) Before taxying, carry out the checks in the Pilot's Check List items 120 to 122.

(ii) Ensure that the canopy seal is OFF before the canopy is opened.

(iii) On reaching dispersal, stop the engine by closing the throttle and then turning off the high pressure cock.

(iv) Carry out the checks detailed in the Pilot's Check List items 123 to 132.