

## PART 3

### CHAPTER 1 — STARTING, TAXYING AND TAKE-OFF

*(Completely revised by AL6)*

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#### 1 Preparation for Flight

Complete the **Pre-External, External, Cockpit, Left to Right and Starting** checks.

#### 2 Starting the Engine

##### (a) *Normal Procedure.*

- (i) Press and release the starter button.
- (ii) When the starter fires, the engine speed should build up rapidly to 1500 RPM. As the engine lights up, the RPM decrease by about 200 and then increase to idling ( $3000 \pm 100$ ).
- (iii) The sequence should take about 30 seconds. The JPT may momentarily exceed the idling limit ( $525^{\circ}\text{C}$ ); the maximum permitted JPT during the start is  $640^{\circ}\text{C}$  for a maximum of 3 seconds. Check that the fire warning light remains out.
- (iv) When the RPM have stabilised, check that the JPT returns to within the normal idling limit and then check that the oil pressure is not less than 10 PSI when the RPM are increased to 3500.
- (v) Complete the **Checks After Starting.**

(b) *Failure to Start.*

- (i) If the cartridge does not fire, close the HP cock immediately. It must not be assumed that the breech is empty and the time switch should be allowed to run out (30 seconds) before attempting a further start. If the second and third cartridges fail to fire, have the defect investigated.
- (ii) If the cartridge fires but the engine fails to light up, close the HP cock without delay. If it is suspected that an excess of fuel has collected in the engine, a second cartridge should be fired with the ignition switch and the HP cock off. This procedure entails a 30 second delay whilst the time switch runs out. A third attempt can be made after an interval of at least 30 seconds (as controlled by the time switch), provided that the engine has stopped.
- (iii) If the starter button does not hold in when pressed (irrespective of whether or not a cartridge is fired), the button must not be pressed again until 30 seconds have elapsed.
- (iv) If the pressure relief valve sticks open (indicated by intermittent clouds of black or yellow smoke from the starter exhaust without RPM indication), wait at least until the time switch runs out (30 seconds) and then fire a second cartridge.
- (v) The run of the time switch must not be shortened by use of the engine master switch, otherwise overspeeding of the starter may occur.
- (vi) If, at the second or third attempt, a successful start is achieved, check that the JPT returns to normal and that the oil pressure is not less than 10 PSI at 3500 RPM and then complete the **Checks After Starting.**

### 3 Taxying

**WARNING:** Heavy braking markedly reduces the brake effectiveness as the heat absorption limit of the brakes is approached. Even moderate braking at low AUW and slow speed can have the same effect if prolonged, eg lengthy taxiing using brakes against power. After any heavy or prolonged braking, allow sufficient time for the brakes to cool before continuing with taxiing or take-off.

- (a) Taxying is normal for a nosewheel type aircraft. Fuel consumption at idling RPM is about 20 lb/min.
- (b) The aircraft should not be taxied at a speed which requires excessive use of the brakes as this causes overheating of the tyres and reduces their life. When full drop tanks are carried, special care should be taken to avoid overstressing the landing gear.
- (c) To avoid discharging the main batteries, engine RPM are to be kept above 3700 during waiting periods before take-off and after landing.
- (d) Complete the **Checks Before Take-Off**.

#### 4 Runway Checks

Align the aircraft and roll forward a few yards to straighten the nosewheel. Apply the brakes with the rudder central and open the throttle smoothly to at least 4500 RPM; check that the power control indicators remain black when the ailerons and elevators are operated over the full range. Continue opening the throttle; if the brakes do not hold at 7200 RPM, they should be considered unserviceable and the aircraft should not be flown. Check that the oil pressure at 7200 RPM is at least 14 PSI.

#### 5 Take-Off

- (a) Release the brakes and open the throttle fully, checking the engine operation (see para 6).
- (b) In crosswind conditions, gentle braking is necessary to keep straight until the rudder becomes effective at 90 knots.
- (c) Ideally, the nosewheel should be eased off the ground between 115 and 135 knots depending on configuration. However, on some aircraft, with the CG well forward, it may prove impossible to lift the nosewheel within this speed band. Under the worst conditions of CG and rigging tolerances it may be necessary to attain 150 knots before the nosewheel can be lifted.
- (d) Coarse rearward stick movement may result in the

tail cone touching the runway when the nosewheel is raised; the tailplane interconnection increases this possibility and it must not be used for take-off. Depending upon weight and attitude, the aircraft unsticks between 130 knots and about 155 knots.

(e) When comfortably airborne, apply the brakes fully, raise the landing gear and complete the **Checks After Take-Off**. There is no noticeable change of trim as the landing gear retracts. Retraction takes 6 to 8 seconds and must be complete before 250 knots is reached.

(f) Until experience is gained the lightness of the flying controls may lead to over-controlling in both pitch and roll.

(g) *When Carrying Stores.* Use 38° flap. When safely airborne immediately raise the landing gear and then the flaps, trimming nose-down as the flaps come up; delay in raising the flaps results in a marked nose-up change of trim when they are raised.

(h) *Manual Reversion.*

(i) Should Manual reversion occur on take-off, it is safe to continue the take-off. Using the recommended trim setting, a strong pull force is required to raise the nosewheel but the aircraft will be in trim at 160 knots.

(ii) In case hydraulic failure has occurred, it is recommended that the landing gear and flaps (if the latter have been used for take-off) are left down, care being taken not to exceed the maximum permitted speed.

## 6 Engine Handling at Take-Off

(a) The RPM are governed at 8100, at which maximum thrust is obtained, but at full throttle this figure varies with OAT whilst still maintaining maximum thrust. The relevant figures are:

+15°C	...	...	8100 RPM
0°C	...	...	8085 RPM
- 10°C	...	...	8075 RPM
- 20°C	...	...	8045 RPM

The RPM at take-off should not be lower than the above figures, allowing a tolerance of 50 RPM.

(b) Malfunctioning of the guide vane system allows the engine to reach maximum RPM without producing maximum thrust and the aircraft accelerates very slowly. Therefore, to verify that maximum thrust is being obtained, the following checks should be made:

- (i) Maximum RPM are not obtained except at full throttle.
- (ii) The rate of acceleration is normal when the brakes are released.
- (iii) The JPT is more than 580°C.

## 7 Abandoning Take-Off

(a) The take-off can be abandoned and the aircraft brought to rest in the remaining length of runway if speed is at or below VSTOP (see Part 5, Chapter 2). If speed is above VSTOP, the aircraft will enter the overshoot area unless a barrier or cable engagement is made. The drop tanks can be jettisoned to reduce the stopping distance, but they should be jettisoned before streaming the brake parachute.

(b) To abandon the take-off:

- (i) Close the throttle.
- (ii) Close the HP cock (if necessary).
- (iii) Stream the brake parachute (160 knots max).
- (iv) Select the flaps fully down.
- (v) Apply maximum braking, ensuring that the speed is at or below the maximum braking speed (see Part 5, Chapter 2).
- (vi) Lower the arrester hook if appropriate.

(c) If at 21,000 lb AUW, the take-off is abandoned at a speed of 100 knots, the aircraft should take the following distance to stop in zero wind conditions:

	<i>Wet Runway</i>	<i>Dry Runway</i>
Without brake parachute ...	3000 feet	2400 feet
With brake parachute ...	2700 feet	2160 feet

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