



FIRST FLYING TECHNIQUES TAKING-OFF

1. Introduction

We aim to teach and demonstrate how to operate a general aviation aircraft and show some basic techniques and manoeuvres that every real pilot must have learnt to be licensed.
In this document, we will learn how to perform an engine run-up and how to take-off.

We use the Cessna 172 as training aircraft which is also a default aircraft in most flight simulators.

Understand we are not learning to fly the Cessna 172 specifically.
We will not review specific practical aspects about this aircraft.

2. Theoretical Knowledge

2.1. Engine run-up

A thorough engine run-up should be done prior to taking-off.

It ensures the good operations of the engine.

Depending on the aircraft, values may differ but the goal is always the same:

1. Push the engine at high RPM
2. Check magnetos at moderate RPM
3. Set suddenly throttle to idle

Contrary to after-start check, at moderate or high RPM, magnetos should never be switched off. The risk is to damage the engine, and in particular, the exhaust line.

Definition of Magneto:

An ignition magneto is a magneto that provides current for the ignition system of a spark-ignition engine, such as a petrol engine. It produces pulses of high voltage for the spark plugs.

The use of ignition magnetos is now confined mainly to engines where there is no other available electrical supply. It is also widely used in aviation piston engines even though an electrical supply is usually available.

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2.2. Taking-off

As an aircraft needs lift to fly, and in particular to counter its weight, there is necessarily a minimum speed at which the flight can happen. This is known as the stall speed.

Lift builds up with the speed.

In order to take-off, your aircraft will need to accelerate past the stall speed.

Manufacturers have to establish a take-off speed which is generally 1.3 times the stall speed.

For our Cessna 172, take-off speed is set to 60 knots without flaps.

Once your speed is sufficient, you can pull the flight control and gently raise the nose of the aircraft by a bit less of 1 cm above the horizon. You can use the artificial horizon to establish a climb angle of approx 8°.

On shorter runways, you can take-off using more flaps setting which decreases the takeoff speed down to 55 knots.

3. Practical Aspects

3.1. Engine run-up



We reached the holding point of the active runway.

Before performing an engine run-up, make sure to apply brakes!

To perform the engine run-up, proceed as follows:

1. Increase throttle to match 2,000 RPM. Check oil temperature and pressure are in the green range.
2. Slow down to 1,800 RPM. Perform magneto check on positions Left – Both – Right - Both.
3. **Do not switch the ignition key to the "OFF" position!**
4. Suddenly close the throttle. Engine must not stall, nor drop below 500 RPM.
5. Establish back 900 RPM.



Typical Key magneto

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3.2. Last actions before taking-off

When entering a runway, a pilot should only do critical actions which are the actions he could not do before, in order to limit runway occupancy time.

Make sure your aircraft instruments are running normally (check standard values and ranges) and extend your flaps if required by the runway length.

When cleared by the controller to lineup on the runway, turn on your strobe and landing lights.

Do not forget to turn ON your transponder on the IvAp interface or via your transponder instrument on your cockpit when entering on a runway.

The switch shall be on the TX position to transmit data.

These data are used by:

- The controllers to locate your aircraft position on radar and retrieve various parameters depending on the chosen version of your transponder in the flight plan form (speed, altitude).
- Other aircraft TCAS in order to locate your aircraft position in comparison of their own position



To be successfully aligned with the runway, look toward the end of it instead of looking just in front of your airplane nose. You should check your compass if it is coherent with the runway heading.



Caution: You can be instructed to lineup on a runway without being cleared to take-off! Wait on the runway until the take-off clearance, but for safety reasons, never use parking brakes on a runway. After receiving the take-off clearance, take-off without delay.

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3.3. Taking-off

When cleared for take-off, switch on the fuel pump and the pitot heat. Open throttle completely, keep runway centreline.



When reaching 60 knots, you can initiate the rotation of the aircraft.

3.4. Initial climb

Immediately after taking-off, establish and maintain a correct climb angle (8°). Check your climb with the vertical speed indicator



Crossing 300 feet, retract the flaps if required and adjust RPM to 2,300 RPM (climb power).

4. Conclusion

We are now completely airborne!

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