STAY IN CONTROL

UK Civil Aviation Authority

PARTIAL POWER LOSS

Guidance for Single Engine Piston Aircraft

Introduction

A partial engine power loss occurs when the engine continues to deliver thrust, but at a level below that commanded. Unlike a complete engine failure, the engine does not simply stop producing power—it performs unpredictably, delivering some thrust but without assurance that it will remain stable.

A total engine failure is something pilots have been taught for several decades. It is clear, decisive, and—ironically—simpler to handle. However, a partial power loss is something altogether more insidious. To address this hazard, the CAA has now introduced partial power loss training into initial and refresher training.

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The complexity of a partial power loss lies in uncertainty. With some power still available, pilots must make effective decisions without knowing how reliable that power is, how long it will last, or whether it will degrade further without warning. This ambiguity can make it difficult to determine the aircraft's true performance capability at a potentially critical phase of flight.

Such scenarios have contributed to serious accidents, particularly when the partial power loss occurs close to the ground. Attempting to continue flight, troubleshoot, or maintain altitude with insufficient or deteriorating power can quickly result in loss of control, often with fatal consequences. Studies indicate that partial power losses occur far more frequently than total power failures.

Despite the statistics, partial power loss events are often underestimated by pilots, who are generally more used to practicing total power failures. Training has historically placed much greater emphasis on total power failures, especially after take-off. As a result, pilots are more likely to have mentally rehearsed that scenario.

Partial power loss, by contrast, is rarely considered in advance. When it happens unexpectedly, the lack of preparation can lead to hesitation, inappropriate decision-making, and delayed actions. This could lead to a manageable situation escalating into a loss of situational awareness, potentially resulting in a stall and/or spin.

How to manage partial power loss in a single-engine aircraft

Pre-flight

A significant proportion of recent partial power loss events that occurred shortly after take-off were preventable.

In many cases, the underlying issues would have been detectable before flight if normal inspection and checking procedures were carried out thoroughly.

Thorough knowledge of the aircraft flight manual or pilot operating handbook, combined with a disciplined approach to walkaround inspections, fuel checks, and engine run-ups, plays a critical role. Monitoring engine indications closely during the early stages of take-off plays a crucial role in identifying developing engine problems.

Investigations frequently trace partial power loss events back to faults in the fuel system, ignition system—including spark plugs—or carburettor icing. These issues often provide warning signs rather than occurring without notice.

- An engine speed reduction during run-up checks when checking magnetos that exceeds the limits specified by the flight manual/pilot operating handbook;
- Failure to achieve an RPM drop and stabilisation following carburettor heat application;
- Static engine rpm at full power that falls below expected or published values;
- Abnormal engine behaviour, such as roughness or changes in sound or vibration, suggesting the engine is not operating normally.

Recognising and acting on these cues before departure can prevent a developing problem from becoming a critical in-flight emergency.

Pre-take-off brief

Before take-off, it is important to consider the possibility of a partial loss of power and decide in advance how you would respond.

Planning for different scenarios—on the take-off roll, during initial climb, and at circuit height—reduces the element of surprise and improves decision-making under pressure.

Remember that using the full runway length instead of making an intersection take-off allows a greater possibility of stopping on the remaining runway or at least within the airfield boundary if an issue occurs.

Especially on shorter runways where performance is critical, consider the point at which you would reject the take-off if a certain speed were not reached and stick to it. One rule of thumb to consider is two-thirds of the take-off speed by one-third of the runway, a visual reference for that point may help ensure decisive action in case of an issue.

Partial power loss during/just after take-off

A partial power loss can present itself in many ways – it may be a rough running engine, it could be surging and falling engine notes, or an engine speed at less than you commanded. In all cases you must maintain control of your aircraft and respond immediately. Taking no action is not an option.

Acceleration along the runway should also be monitored to confirm it is normal.

Accident reports show that, in some cases, symptoms such as rough running, lower than recommended static RPM, or sluggish acceleration were present before rotation, but the take-off was continued, often due to uncertainty about the significance of these indications.

Know your aircraft, if something doesn't seem right and you are still on the runway, in most cases it is safest to reject the take-off. Staying on the ground is more likely to lead to a better outcome, even if it results in a runway excursion.

In the first few seconds after take-off, the safest course of action is to lower the nose to ensure that speed is maintained. Take the option to land within the airfield boundary, if available, and close the throttle to maximize available landing distance.

Only conduct any troubleshooting if there is sufficient time, in most low-level scenarios, there may not be, and diagnosing the cause of the engine problem should never be attempted at the expense of maintaining control of the aircraft.

At low levels where sufficient space within the airfield boundary is unavailable, there may not be time to do anything other than to treat the partial loss in the same way as a full loss of power. Where you cannot land within the airfield boundary, continue flying the aircraft and conduct an off-field landing. Do not rely on the situation improving just because some power may exist, it is generally safer to treat the failure as you would a full engine power loss and remove the uncertainty of the scenario.

Turnback options in partial power loss events are extremely hazardous and should only be considered if significant height and sufficient power remain to maintain height without concern. It is nearly always safer to limit low level manoeuvring and land ahead.

Above all, maintaining a safe speed and limiting bank angle to no more than moderate is key to avoiding a stall/spin accident. Reaching the ground with the wings level and the aircraft aligned with the terrain, rather than after a stall or spin, can be the critical factor in the outcome.

Partial power loss in the circuit

A partial power loss in a circuit where you are unable to maintain height should be treated the same as a full loss of power with a glide approach made towards the airfield or a suitable landing area off-airfield. Choose the most suitable landing option with the best available wind component, avoiding any tailwind component where possible.

Pilots should not attempt to stretch the glide or remain airborne to complete a normal circuit to the runway. In many cases, a controlled touchdown under power-off conditions, even if short of the runway, is preferable to a loss of control resulting from excessive manoeuvring at low height.

Partial power loss in the cruise

With sufficient altitude in the cruise, there will be more time to deal with a partial engine failure, though one should not become complacent that the situation will not further deteriorate.

Know the potential warning signs of a developing partial power loss.

- Engine running rough or vibrating
- Gradual or fluctuating drop in RPM / manifold pressure
- Unexpected decrease in fuel pressure or fuel flow
- Rising or abnormal engine temperatures (CHT / EGT)
- Falling oil pressure or rising oil temperature
- Changes in engine sound (sputtering, uneven firing)

It's worth knowing in advance what engine RPM setting you need to maintain level flight at best glide. Taking an opportunity to practice this exercise with an instructor will really speed up the decision-making process should a real partial power loss scenario occur.

When a partial power loss occurs during the cruise, you should initially set the best glide speed and determine whether enough engine power remains to maintain height and therefore safely divert to the closest usable airfield.

If there is any doubt, then you should choose the closest available safe forced landing area to conduct a forced landing.

If you decide to proceed to another airfield, you should continue to select suitable forced landing areas until such time you can make a glide approach to your diversion airfield. At no point should you be reliant on the engine power to reach a safe outcome, it could fail at any moment.

Don't forget, when able you should make a distress call to the most appropriate agency, especially before you get too low. But always aviate, navigate, communicate!

Summary

Partial engine power loss presents a complex and hazardous scenario, particularly at low altitude, where uncertainty over remaining engine performance can quickly erode safety margins. Evidence from studies shows that such events occur more frequently than complete engine failures and are often preceded by detectable indications that go unnoticed.

Effective risk mitigation relies on thorough pre-flight and pre-take off checks, pre-take-off briefing, and the early recognition of abnormal engine behaviour. When a partial power loss does occur, take prompt action to maintain control of the aircraft, ensuring safe airspeed and then select a suitable landing area with minimum low-level manoeuvring.

Partial power loss at low height should normally be treated as a full power failure, avoiding attempts to stretch the glide, troubleshoot excessively, or trying to turn back to the airfield at low level.

By improving awareness, training, and decision-making around partial power loss, pilots can reduce the likelihood of loss of control and significantly improve the chances of a survivable outcome.

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