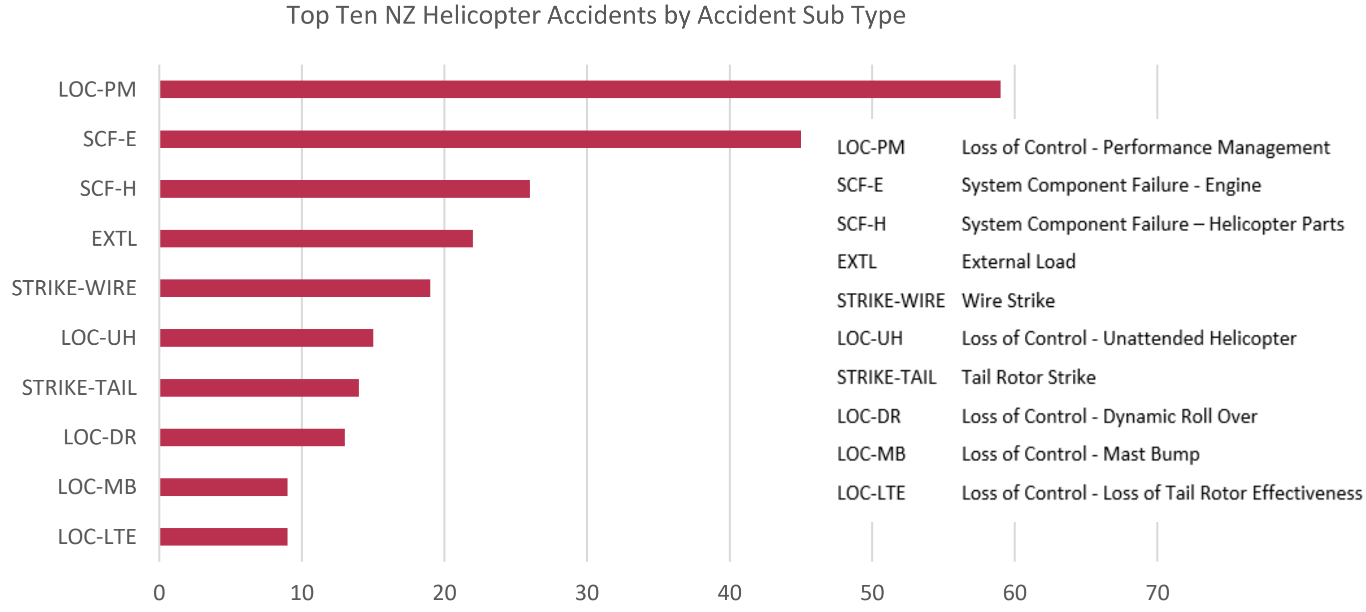
NZHA Helicopter Safety Initiative – Notice 1 – Treating the Biggest Cause of NZ Helicopter Accidents

Loss of Control – Performance Management (LOC – PM)

A NZHA/CAA analysis of all New Zealand helicopter accidents between 2000 and 2019 has shown that the most commonly-occurring helicopter accident is Loss of Control due to poor Performance Management (LOC-PM). This aligns with International Helicopter Safety Foundation (IHSF) data.



What is a Loss of Control – Performance Management Accident?

These accidents occur when insufficient power or rotor RPM are maintained for the prevailing conditions. The main causes are:

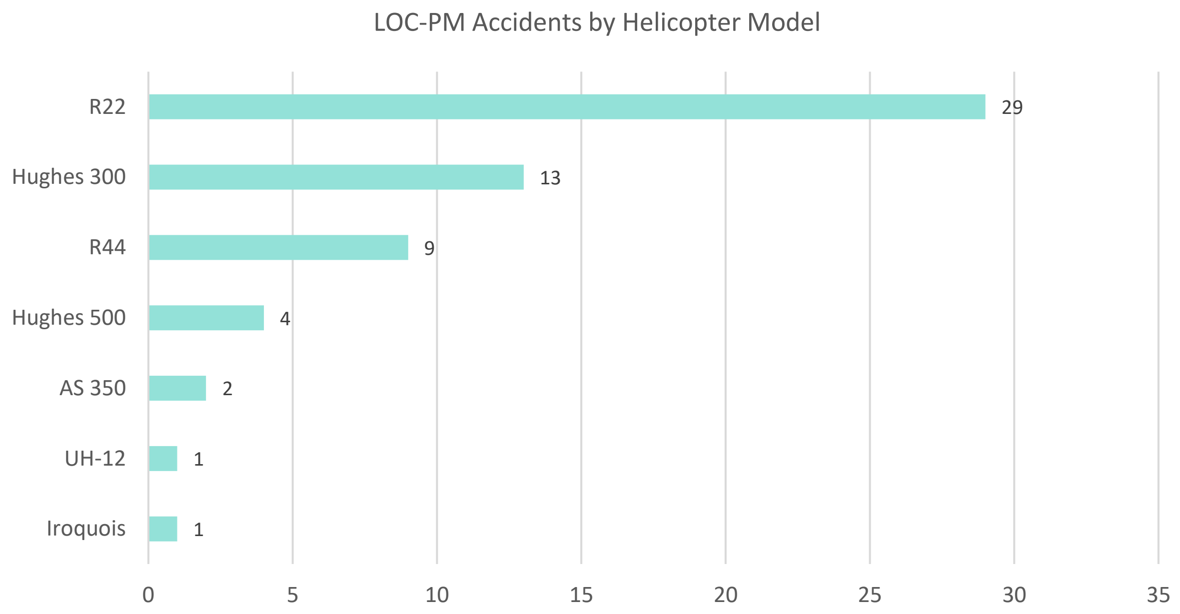
- out of wind,
- in light and variable wind,
- at or above the operating limitations of the helicopter, particularly over the hover OGE weight for the density altitude.

> *It is vital that a helicopter pilot know the direction of the wind in any flight regime. So much so that the simplest manoeuvre can turn into a disaster if the wind is coming from an unexpected direction.* Greg Whyte in 'Fatal Traps'

The accident descriptions at the end of this document provides some typical examples.

What helicopter types are involved?

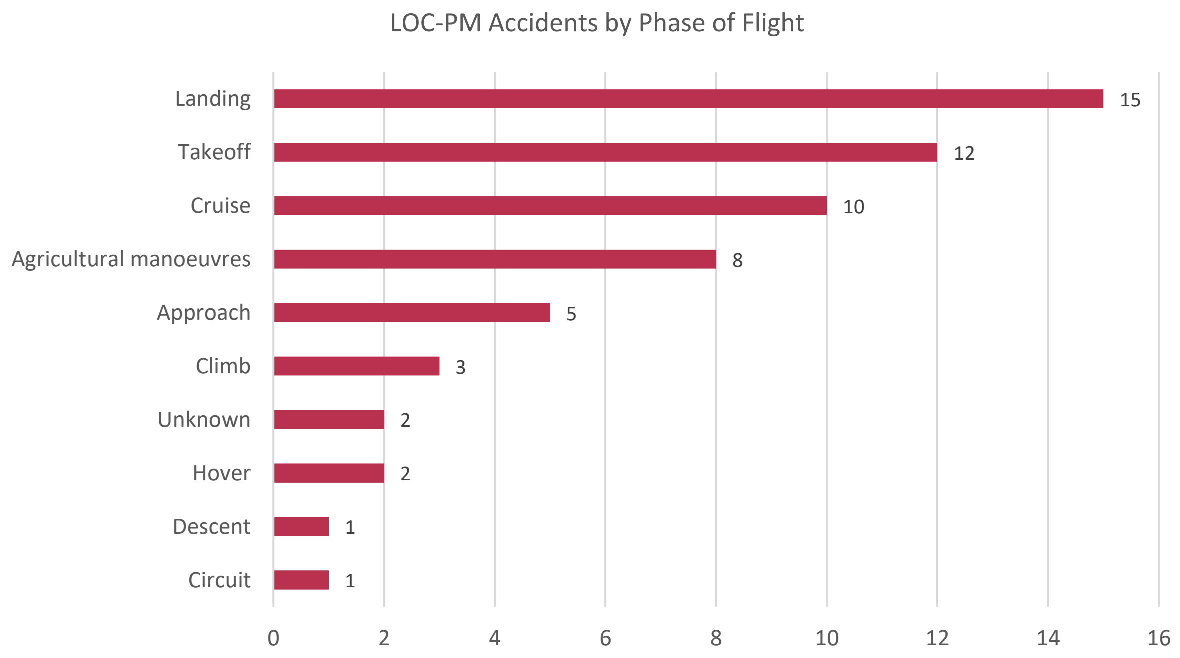
Both piston and turbine helicopters. Light piston helicopters (with less power available) are more likely suffer power management issues, however, more powerful aircraft such as the AS350B2 are also represented in the statistics.



Do any particular flight phases present greater risk?

Yes,

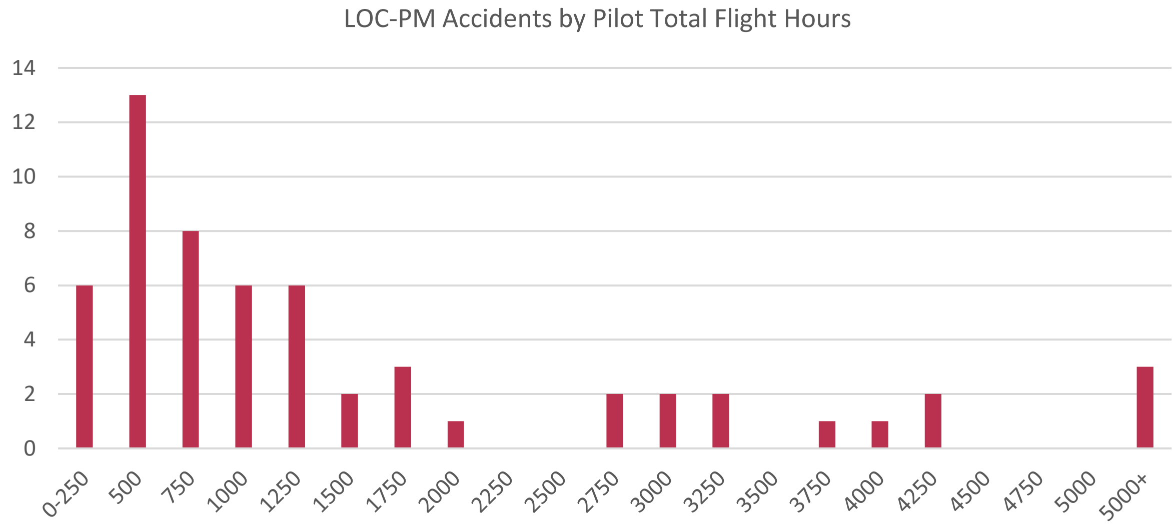
1. landing,
2. takeoff,
3. cruise and
4. low level manoeuvres such as in agricultural work.



Does pilot experience play a role?

Yes. The 'experience factor' is evident when we look at the number of accidents by pilot total time. Experienced pilots (>5000 hours) have these types of accidents too but you are at greater risk if you have:

- less than 250 hours on type or
- less than 1500 hours total time



What are the main causal factors?

In their analysis of LOC – PM accidents, the International Helicopter Safety Foundation identified the following as the top causal factors:

1. Inadequate consideration of aircraft performance
2. Inadequate consideration of weather / wind
3. Failed to recognize cues to terminate current course of action or manoeuvre

What can you do?

1. Assess your aircraft's performance capability
    - Check aircraft performance for the density altitude you intend operating at. Remember density altitude is pressure altitude corrected for non-standard temperature. There are a number of free electronic means to do this or rules of thumb. (Difference from ISA: 1 degree = 120ft; 1 hPa = 30ft)
2. Know how to complete Operational Power Checks
    - Operational Hover Check:
        - 2' Hover Check - check power. What sort of departure does that power allow you to do? Is there a sufficient margin to operate at the destination DA?

- Airborne – Operational Power Check
  - At landing elevation Check DA (set PA 1013; or Difference from ISA: 1 hPa = 30ft and 1°C = 120ft;)
  - Min power check – fly at Vy level – check power required
  - Pull Max Power - check power available (Limited by Tq/Temp/N1?)
  - Can hover HOGE/HIGE? Wind, What type of approach? Decision making.

3. Know the wind direction all the time.

   Wind indicators: smoke, water (wind lanes and shadowing), leaves on trees (silver side up), drift, turbulence relative to terrain, figure 8, constant bank 360 degree turn

   - Draw a line between the pedals on approach, a perpendicular line can indicate the side the wind is coming from.

Wind left of the nose   Wind right of the nose

   - Use survey tape (wind indicator) where possible
   - Light and variable wind, especially at higher temperatures causes performance issues (see Mi-8 graph at end).

4. Fly the Escape with the option to land

   - Always fly your approach such that you intend to fly the escape, either to the low ground or escape to the landing zone.

Accident Examples

February 2003

Kaimanawa Ranges

Hughes 300

The pilot was carrying out a demonstration flight for a potential client, and intended to land on a peak in the Kaimanawa Ranges. On approach, the pilot misjudged the wind direction and encountered a higher than expected rate of closure with the intended touchdown point. The pilot attempted to retrieve the situation by running the helicopter on to the ground then *taking off again. However, there was insufficient space for this manoeuvre and the helicopter nosed over. The pilot received minor injuries and the two passengers were seriously injured.*

December 2006

Mount Ruapehu

Hughes 500

On 11 December 2006, a Kawasaki-Hughes 369HS helicopter took off with the pilot and 4 passengers on board from near Crater Lake on Mount Ruapehu, at an elevation of about 8300 feet. The pilot could not climb the helicopter above the surrounding terrain, so he descended towards the lake to accelerate the helicopter towards its best-angle-of-climb speed. The helicopter hit the lake surface and came to rest on the shore of the lake. All of the occupants were injured and the helicopter was destroyed. No technical defect was identified with the helicopter, but because of post-accident damage and deterioration to the engine, the possibility of reduced engine performance for an undetermined reason could not be excluded. The take-off weight was estimated to have been 40 lb over the maximum allowable. It was highly likely that the take-off weight exceeded the maximum certificated weight. The helicopter did not have sufficient power, under the prevailing environmental and load conditions, to achieve a safe take-off.

July 2008

Canterbury

Hughes 500

On approach for a landing by a hut in high country terrain, the Pilot decided to land at another site, turned to go back down the valley and got caught by a strong gust of wind. The helicopter hit the ground and slid 50 metres. The pilot's inexperience meant he did not fully appreciate or evaluate the risks involved in making the manoeuvre to change landing sites in the gusting conditions that prevailed at the time.

August 2014

Mount Alta

Airbus AS350B2

On the approach to the landing site the helicopter began to descend below the pilot's intended angle of approach. The pilot discontinued the approach by turning the helicopter away from the ridgeline and down the mountain. However, the pilot was unable to avoid the terrain and the helicopter struck the steep, snow-clad slope heavily and rolled 300 metres down the mountain. The helicopter was operating at or close to the limit of its performance capability to maintain a hover outside of 'ground effect' at that weight and at the temperature and altitude of the landing site. This was a likely factor in the pilot not achieving a safe landing. The Commission was unable to make a conclusive finding on whether the helicopter was affected by a phenomenon known as 'vortex ring state'.

Further TAIC Reports – 93-002; 14-005; 16-006;

IHSF Category Glossary

LOC-PM	Loss of Control - Performance Management
SCF-E	System Component Failure - Engine
SCF-H	System Component Failure – Helicopter Parts
EXTL	External Load
STRIKE-WIRE	Wire Strike
LOC-UH	Loss of Control - Unattended Helicopter
STRIKE-TAIL	Tail Rotor Strike
LOC-DR	Loss of Control - Dynamic Roll Over
LOC-MB	Loss of Control - Mast Bump
LOC-LTE	Loss of Control - Loss of Tail Rotor Effectiveness

Mi-8MTV-1 Performance Graph – Weight vs Wind Velocity and Direction with use of ground effect.

This Mi-8MTV-1 graph highlights a 10% performance degradation with 7.7 knots of tail wind (MAUW 13,000kg). If you have the wind wrong the degradation in performance can be catastrophic.