Main characteristics of helicopter flight

The lift and propulsion of a helicopter are obtained by the reaction on its rotor of the flow of air which this sends perpendicularly to the plane constituted by the extremities of its blades in movement. When the helicopter flies close to the ground (up to a height close to the length of the diameter of the rotor) at a speed which is not sufficiently high (up to approximately 20 knots) for numerous jets constituting this flow to be not simply diverted horizontally but their movement stopped, their kinetic energy is transformed into pressure energy constituting an air cushion.

It is immediately apparent that, if available space permits, it is useful to provide a heliport with an area sufficiently equipped to allow helicopters using it to benefit from this support effect at the start of lift-off as well as at the end of the landing operation and thus evolve a clearing procedure.

The only resource available to the pilot of a single-engine helicopter in case of engine failure is autorotation of his equipment. Pulled along by the flow of air which naturally crosses it from bottom to top, the rotor gives a support to the equipment which, although it is much less than its weight, allows it to stabilise its descent and land safely.

Unfortunately it is between two heights, in relation to the ground, where this stabilisation can be achieved, the lower one taking into account useful inertia of the rotor at the moment of engine failure.

![Diagram of height/speed and unsafe zone](Diagram of height/speed and unsafe zone (Rights reserved by the DGAC))

**Hauteur du dessus du sol** – Height of top of ground
**Zone d’insecurité** – Unsafe zone
**Zone de securité** – Safe zone
**Vitesse indiquée** – indicated airspeed

Points D and A, shown on the graph, correspond to the situation where engine failure occurs in the stationary flight phase.
The case of the pilot taking advantage of horizontal speed V1 acquired in order to prime the autorotation of his equipment shows that the two points D and A can, in such situations, draw closer.

A height/speed diagram can thus be drawn up which defines an unsafe zone which is forbidden or at least inadvisable.

It can already be seen that, since the take-off procedure from an area of reduced dimensions forces the pilot to enter the unsafe zone, it is only authorised in certain cases for single-engine helicopters.