

WAKE TURBULENCE

As the lift producing airfoil passes through the air, the air rolls up and back about each wing tip producing two distinct counter-rotating vortices, one trailing each wing tip. The intensity of the turbulence within these vortices is directly proportional to its weight and inversely proportional to its wingspan and speed of the airplane.

INTENSITY OF WAKE TURBULENCE

The heavier and slower the airplane the greater intensity of air circulation in the vortex cores. The most violent vortices are generated during take-off and landing.

AIR DENSITY

In cold air the vortices can be expected to be more severe.

VORTEX STRENGTH

The greatest vortex strength occurs under conditions of clean configuration, high weight and slow speed.

FACTORS THAT AFFECT VORTEX STRENGTH

- Configuration of the airplane
- Flaps
- Undercarriage
- Location of engine
- Tail configuration

HAZARDS

Vertical gusts encountered when crossing laterally through the vortex can impose structural loads as high as 10gs on a small airplane. The combination of upward and downward gusts has been estimated as high as 80'/sec. Most small airplanes are designed to handle 30'/sec.

STRUCTURAL DAMAGE

There is a possibility of structural failure when an aircraft crosses a pair of vortices. The strong up and down forces combined and the pilot's attempt to counteract them will result in loss of control and airframe design limits being exceeded.

VORTEX GENERATION

- A. Vortex generation starts at rotation (the raising of the nose from the runway) and increases in intensity at lift off when full weight of the aircraft is sustained by the wings.
- B. It ends when the airplane touches down.
- C. Vortices may trail as far as 10 to 16 miles depending on the airspeed of the aircraft.
- D. Wake turbulence usually dissipates after two minutes. But can remain as long as five minutes.

CROSSWIND

Vortices tend to move laterally outward over the ground at a speed of about 5 knots. This means that the vortices may position themselves parallel to the runway and constitute a hazard to aircraft operating in that area. Crosswind effects wake turbulence. The stronger the cross wind, the more vortices get blown to the side.

WAKE TURBULENCE AVOIDANCE

During Flight

- Although wake turbulence is most likely to be encountered during arrival and departure, it can be a hazard at cruising altitudes as well.
- Avoid crossing behind and less than 1000' below the flight path of large, heavy aircraft, especially at low altitudes.

During Taxi

- Stay well behind large aircraft that are taxiing or maneuvering on the ground.
- Avoid going behind aircraft doing a run-up.
- Avoid taxiing below a hovering helicopter (the down wash is significant and hazardous).

During Take-off

- Stay up wind of a large airplane. This action and normal climb should keep you above the descending vortices of the preceding airplane.
- When following an aircraft that has just landed plan to be airborne beyond the point of touchdown of that aircraft.
- For an intersecting runway, plan to be airborne before you cross the intersection.

During Landing

- When following a heavier aircraft that has just taken off, plan to touch down before the rotation point.
- When following an aircraft that has just landed plan to touch down beyond the point where the preceding aircraft touched down

Above All

- Avoid a long dragged in approach. The largest number of dangerous encounters with wake turbulence has been in the last half mile of approach.

ATC ADVISEMENT

ATC cannot guarantee that wake turbulence will not be encountered. When the ATC advises, “**CAUTION WAKE TURBULENCE**”, he is warning you of the possible existence of wake turbulence.

AVOIDANCE RESPONSIBILITY

It is the sole responsibility of the pilot in command (PIC). Even though you have received a clearance to land or take off, if you believe it is safer to wait then ask the controller to do so.

HUMAN FACTORS

Hypoxia

A lack of sufficient oxygen in the body cells or tissues. The Canadian Aviation Regulations rule that when flying, by day, over 10 000 feet to 13 000 feet for more than 30 minutes or above 13 000 feet, you must carry a supply of oxygen of at least 2 hours for every crewmember.

Blood donation

It is recommended to wait 48 hours before flying after blood donation.

Alcohol

The rule for both pilot and passenger in relation to alcohol quite simply should be “**No alcohol in the system when you fly**”. Canadian Aviation Regulations require that a pilot allow at least 8 hours between the consumption of alcohol and flying and 48 hours after excessive drinking.

Drugs

Do not self-medicate. Drugs, as well as the conditions for which they are taken, can interfere with the efficiency of the pilot and can be extremely dangerous.