## **THUNDERSTORMS**

A weather phenomena whose presence creates extremely serious hazards to flying. They may be accompanied by:

* Thunder;
* Lightning;
* strong vertical drafts;
* severe gusts and turbulence;
* heavy rain;
* hail;
* micro/macro bursts;
* tornadoes; and
* severe wind shear.

It is a weather condition of which a pilot should be enormously respectful.

**Thunderstorms must have the following requirements:**

1. Unstable air to high levels;
2. Lifting agent; and
3. High moisture content.

#### THE LIFE OF THUNDERSTORMS

**Initial or Cumulus Stage**

* Strong updrafts prevail (unstable air to high levels);
* Temperature is higher inside the cloud than the surrounding air;
* Diameter ranges from one to two miles (but may become as large as six miles); and
* Steep lapse rate.

**Mature Stage**

##### Updrafts penetrate to great heights;

* Downdrafts start in middle and lower level of cell;
* Precipitation starts; and
* Stage usually lasts 15 to 30 minutes (may last as long as 60 minutes).

**Dissipating Stage**

* Downdraft occupies all but top of cloud where updrafts persist;
* Rain starts to slow and stop; and
* Top of cloud frays into anvil shape.

**TYPES**

###### Air Mass

* Usually form on hot summer days;
* Relatively easy to avoid; and
* Form as a result of either convection or orographic lift.

###### Frontal

* Associated with cold fronts;
* Usually form in a line that may extend for hundreds of miles of cold front, known as a LINE SQUALL; and
* Can develop at warm front and may be embedded.

**THUNDERSTORMS HAZARDS**

TURBULENCE

* Could overstress aircraft or cause loss of control;
* Downdrafts as strong as 2000 feet per minute and updrafts as strong as 6000 feet per minute that can severely cripple aircraft;
* Strongest between 12,000 – 20,000 feet in mature stage;
* Can be experienced, in clear air up, to 20 miles away from severe cells; and
* Can be severe in micro/macro bursts and at gust front.

WINDS

* Danger of gusts up to 80kts with rapid changes in direction; and
* Gust front generates strong, gusty winds near the surface which can change direction by 180° and gust up to 50 kts in seconds.

**HAIL**

* Could cause serious structural damage; and
* Can be encountered outside of cloud as it is thrown upward and outward by active cells.

ICING

* Abundance of supercooled water droplets, will cause severe icing; and
* Most severe during the mature stage.

##### **LIGHTNING**

* Hampers vision for 30 – 50 seconds at a time;
* Greatest likelihood of strike at temperatures between -5°C and + 5°C);
* Solid state circuitry is particularly vulnerable to strikes;
* Electrical circuitry may be disrupted; and
* Possibility of igniting fuel vapour in fuel cells.

PRESSURE

* Rapid changes in pressure cause unreliable altimeter readings.

# THUNDERSTORM AVOIDANCE

* If you must fly past one, stay at least 15 miles away and pass to the right;
* A thunderstorm is an area of low pressure (anti-clockwise and inward);
* You will encounter more favorable winds (tailwind) if you pass to the right; and
* Never fly under a thunderstorm due to up/down drafts.

### BEST ADVICE – STAY ON THE GROUND