

Predicting and Understanding Turbulence

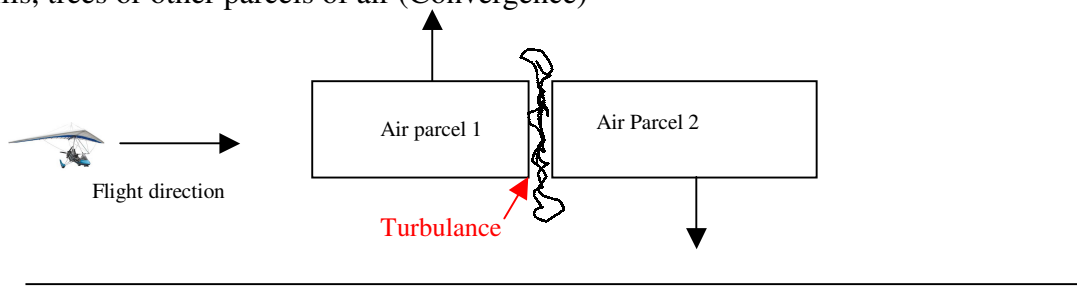
By Andrew Wright

What is Turbulence and where does it come from. Turbulence is the stuff that bounces you around, makes flying uncomfortable and difficult and can definitely be dangerous, to large and small aircraft. When turbulence is understood and predicted it becomes easy to avoid allowing you to fly safely and comfortably even when turbulence exists in your area.

Turbulence can be caused by wind shear, i.e. two parcels of air moving relative to one another, or by a parcel of air moving relative to the ground. These parcels can be big, 100s or 1000s of miles across, or very small, 1 or 2 feet across. There are two types of wind shear and **the difference between the two types is important to pilots.**

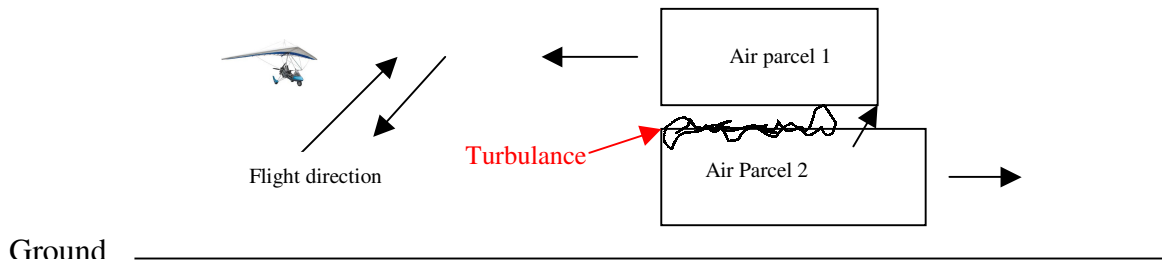
1. Horizontal Wind Shear.

We encounter horizontal wind shear when flying horizontally. Horizontal wind shear can be caused by, amongst other things, thermal currents and air meeting obstructions such as hills, trees or other parcels of air (Convergence)



2. Vertical wind shear

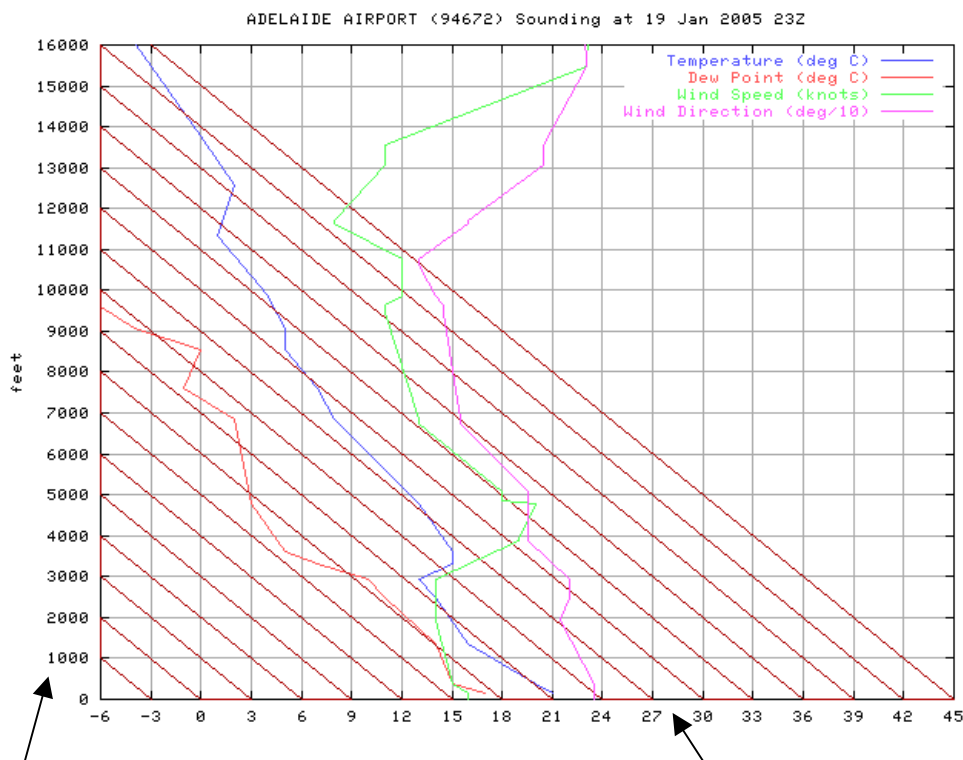
We encounter vertical wind shear when climbing or descending. Vertical wind shear can be caused by, amongst other things, large, (continent size) or small (local area size) pressure gradients, (high and low pressures.)



The difference between these two types of wind shears is important because if you can predict them you can then fly so as to avoid the turbulence they produce.

Predicting turbulence. Turbulence near to the ground and at height is easy to predict. One of the best ways to predict turbulence is to learn to read the chart (Atmospheric Sounding) produced at this web site, <http://slash.dotat.org/cgi-bin/atmos?loc=94672&latest=1>. (The site is a gliding site but it doesn't smell near as bad as most glider pilots smell.) By-the-way, glider pilots need to be able to read this stuff because turbulence is good for us. Turbulence keeps gliders in the air, "it is our fuel"!

Below is a “Sounding” that we can look at and learn how to read.



The vertical axis (Y) axis is altitude in feet. The horizontal (X) axis gives 4 different scales depending on what you want to read. The (X) axis of the graph gives information about;

- Temperature in °C, the blue line,
- Wind direction in degrees true (divided by 10), the pink line,
- Dew point in °C, the red line, and,
- Wind strength in knots, the green line.
- The brown lines are the dry adiabatic lapse rate lines. (The dry adiabatic lapse is the rate at which an unsaturated {i.e. not cloudy} parcel of air will cool as it rises. Used to predict thermals.)

We can now use this chart to predict;

- Vertical wind shear and the turbulence it might bring;
- Horizontal wind shear and the turbulence it might bring. (Avoiding wind shear makes for easier more fun flying.);
- The presence and height of a temperature inversion. (Flying above the inversion is smooth and good for trike pilots.);
- If cloud will form during the day and the cloud base and cloud depth at various times during the day. (Getting caught above cloud and flying in cloud is both illegal and dangerous);
- The likely-hood of a sea-breeze and the turbulence it might bring (Sea breezes bring strong winds and turbulence);
- The likely –hood of a gully wind and the turbulence it might bring. (Gully-winds bring strong blustery winds and very rough turbulence);
- The time of day when sea breezes and gully-winds may start and stop. (This can help you choose the best time of day to fly your trike);
- The time of day when thermals might start and stop. (This also help you choose the best time of day to fly your trike);
- The height and strength of thermals during the day. (This can help you choose the best height at which to fly your trike);