Basic Instrument Explanations

Air Speed Indicator

IAS (Indicated Air Speed)

The Airspeed Indicator (ASI) measures the dynamic air pressure in the pitot tube, which is then presented on the ASI, which in turn is calibrated to indicate Nautical Miles per Hour (Knots). This is known as the Indicated Airspeed.

TAS (True Air Speed)

With an increase in height both the air temperature and the air pressure decrease, that is, the "air density" decreases with height. If you like the air is much "thinner" at altitude. Another way of looking at it is that a given volume of air at high altitude will have less particles of air in it, than the same volume of air at sea level. Consequently a glider will have to move through the air faster at higher altitudes to build up the same dynamic pressure in the Pitot tube that it would have at sea level.

VNE doesnt change significantly till 6000ft (Indicated) QNH
VNE at 9000ft is 130knts IAS
VNE at 12000ft is 124knts IAS
VNE at 15000ft is 117knts IAS
VNE at 19000ft is 111knts IAS
VNE at 22000ft is 105knts IAS
VNE at 25000ft is 99knts IAS
VNE at 28000ft is 93knts IAS

What does this mean in practical terms? Care needs to be taken when flying at high altitudes as a pilot could in avertedly pass "maximum rough air" or even "VNE" even though it does not show up on the ASI. It's worth noting that the ASI will always read correctly relative to the stall speed - irrespective of altitude. That means if a glider will stall at 40kts at 1000ft, it will stall at an *indicated (IAS)* 40kts at 10,000ft. The ASI will NOT read correctly relative to VNE though.

Altimeter

The altimeter is simply an instrument that measures air pressure and then presents that pressure on the altimeter, which is calibrated to read feet instead of air pressure. So as the air pressure changes, that is, reduces as we climb and increases when we descend, the changed air pressure will be shown on the altimeter as height in feet.

QNH

With QNH set, the altimeter will read the altitude of the glider Above Mean Sea Level (AMSL). For example, at sea level the reading will read zero and McCafferys Airfield will read 1260ft above sea level. Before takeoff each time, simply set the height above sea level on the altimeter. Simply setting the altimeter to zero every time we fly will not work as another airfield may be at a different altitude.

It is very important to set the correct QNH before take off for the following reasons:

- When a glider (or aircraft) reports its altitude you have an immediate reference of its altitude relative to yours, this has got to be good for collision avoidance and searching for other gliders, and
- All maps display terrain and spot altitudes in feet relative to sea level (ie QNH), so without the correct QNH set it is not possible to accurately know your height above terrain.

AGL / QFE

With QFE set, the altimeter will read the height of the glider Above Ground Level (AGL). If this is set, the altimeter will read the height that the glider is above that airfield and nothing else.

You should never use QFE for the following reasons:

- If an aircraft transiting our area reports its altitude and you have set QFE, it is not possible for you to know his height relative to your own.
- If you are out and about the local area and another glider reports the height that thermals are going to, this has no relevance to you as you have QFE set.
- QFE may be good for flying circuits at McCafferys however it may have serious consequences away from the airfield. For example, due to the gently rising terrain enroute to Toowoomba, a 1,000 ft circuit at McCafferys translates to a 400 ft circuit at Toowoomba.

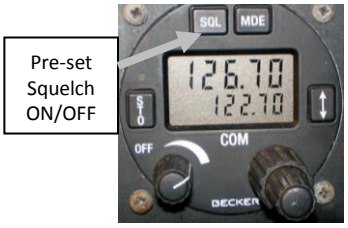
Radio

Squelch

A radio's squelch function eliminates the background noise which is the same sound heard on an AM/FM radio at home that is not tuned to a radio station. If this background noise is not eliminated then the constant sound will become annoying for the pilot and the radio will use far more power resulting in lower battery life.

All aircraft radios have an adjustable squelch with older radio's being manually set and newer radio's set during initial install into the aircraft. While it is important to eliminate background noise, if the squelch is set too high it may not allow wanted radio transmissions to get through either so it is important to set it correctly.

A manually settable squelch will have a knob on the face of the radio. To set the Squelch, simply rotate the squelch knob fully in the direction so that you can hear the hisss of the background noise. Then slowly rotate the knob the other direction until the background noise disappears. Turn the knob a tiny bit further to make sure no noise gets through and the squelch is set. Preset squelch's won't have an adjustment knob but will have a switch that will turn off the squelch to receive weak signals.



Radio Transmission Checks

Before flying, radios must be checked for correct transmission and reception. A pilot will call another aircraft and ask for a radio check. The correct response is to rate the transmission clarity and volume out of five. One being the worst and five being the best. For example: XOW, reading you five. Another way to confirm the radio is receiving properly is to tune to a weak signal. At DDSC, the Oakey ATIS on 124.3 offers just such a thing. Tune to 124.3 and listen for the ATIS recorded message, you may even need to open the squelch as previously instructed. Don't forget to tune back to the operating channel.

Vario

A fast response rate of climb instrument usually scaled to match typical glider rates of climb and descent.(+/-10 knots). The variometer makes soaring possible by displaying the glider rate of climb to the pilot in near real time, enabling the pilot to manoeuvre the glider so as to remain in rising air. Variometers come in many types, some sense the airflow from a capacity bottle or flask (as the outside pressure increases or decreases due to altitude changes, air flows in or out of the flask to equalise the pressure) either mechanically or electrically, others measure the air pressure directly using silicon pressure transducers and compute rate of climb electronically from the changes measured. All instruments suffer from lag and vario's can have around 1 to 3 seconds of lag.

Mechanical Vario

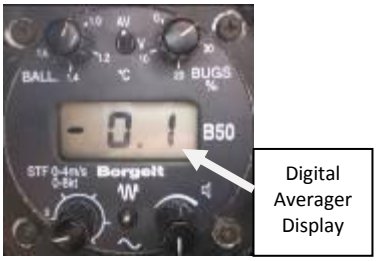
Mechanical vario's do not require electrical power to operate. Mechanical vario's don't have all of the fancy features that most electric versions do, but because they don't rely on electricity to power them they are at the very least a good back up in case of a power failure.

Electric vario

As the name applies, an electric vario requires power to operate but in doing so gives the pilot some other features.

Audio – To allow better lookout, electric vario's can give out an audio tone that changes as the lift increases or decreases.

Averager – Some electric vario's can give an average climb rate over a 20 or 30 second time period. This will give the pilot a more accurate actual climb rate as it is averaged over about one thermal turn. Some instruments will also give a bottom to top average (from when the glider starts turning to when it exits). Most basic electric vario's will show the average climb rate on the dial when holding down a button while the audio remains as a standard TE (Total Energy) vario. Higher end vario's will have a separate LCD screen showing the average climb rate.



Netto Vario

A Total Energy (standard) variometer as described above can be further improved as the standard vario will, in still air, not take into account the sink rate of glider at the speed being flown. As a glider increases airspeed, its sink rate also increases and this will show up on a standard vario as sink. A netto vario knows the polar curve (sink rate at various speeds) of the glider and is plumbed up to sense the airspeed. The end result is that the gliders sink rate is removed from the vario reading at all speeds. What this does is to help the pilot to pick the best path through the air in cruise (which is the path with the most and fastest rising air and ***OR*** the least and slowest sinking air). It also helps a pilot to decide whether or not to turn in lift while in a fast cruise as a standard TE vario won't show the full strength of the lift. For example 8, knots of lift may only show up as 3 knots due to the gliders sink rate at high speed.

Relative Netto Vario *(or Super Netto)*

There is one disadvantage with a netto vario and that is if we fly through our thermal rising at 8 knots we see 8 knots on the netto vario regardless of the airspeed we are flying at. This is fine until we begin to turn and thermal as a netto vario is only set for straight line flight and by turning, the gliders sink rate has increased for the same airspeed. A relative netto vario will compensate for the circling sink rate of the glider. What this means is that in "still air" while cruising, the vario will read about 2 knots down at all speeds. Not perfect for cruising but will still work fine if the pilot takes it into account The up side is that the vario will show what the climb rate will be if the pilot decides to turn in lift.

Static Ports/Pitot Tube/T.E. Probe

A pitot tube collects airflow for instruments such as the ASI and measures forward airspeed. They are usually situated either in the nose or half way up the tail fin. When testing for ASI operation the pilot should blow gently into the tube from an inch away. Do not close your lips around a Pitot tube and blow as instrument damage will occur. Blockage can occur from insects or mud wasps building nests inside and the pitot should always be covered when the glider is being stored.

A static port is basically a small hole in the side of the fuselage that measures static air pressure. These ports can be on both sides of the nose around the canopy and/or half way down the tail boom. Static ports should always be clear of blockage.

The TE probe is used by the vario and measures lift. The back of the tube will have two small holes that measure the air pressure and should always be clear of blockage. To test, loosely clasp hand around TE probe and gently suck into closed fist. The lowered air pressure will show up as lift on the vario. Do not close your lips around the TE probe and suck or blow as instrument damage will occur.