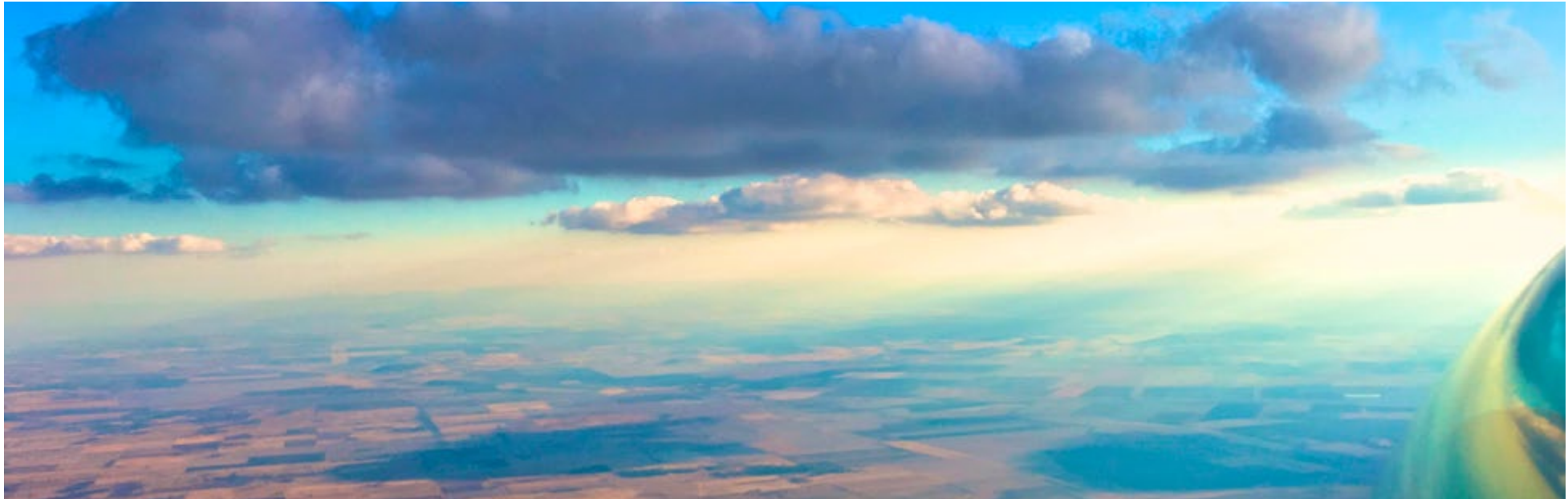


An aerial photograph of a vast landscape featuring rolling hills and mountains under a dramatic, cloudy sky. The sun is low on the horizon, casting a golden glow. The tail and wing of a white airplane are visible in the upper left corner.

# KEEP SOARING

SPRING 2016

ALL IN THE GOLDEN AFTERNOON  
FULL LEISURELY WE GLIDE  
BENEATH SUCH DREAMY WEATHER,  
BENEATH THE SETTING SUN.  
THE DREAM-CHILD MOVING THROUGH A LAND  
OF WONDERS, WILD AND NEW,  
HOME WE STEER, A MERRY CREW.  
LEWIS CARROLL



It's finally spring! I know that's hardly an excuse for putting a pome on the cover but I thought it odd that Lewis Carroll was into gliding.

The soaring season has kicked off to a cracking start with Allan Barnes flying a cracking 160 km flight via Mullaley to somewhere near Breeza. (Odd place to land but maybe it was at Sam Clifts.) John Hoye flew long and hard, longer than Allan but his OLC trace was marred by some engine noise in the middle.

Whatever happend to Global Warming! If you read on, you will find Garry Speight's answer to this. Anyway, it's still on the early spring and we're sure to have lots of great weather to come when things warm up.

## **CHALLENGE YOURSELF!**

If you are a conservative flyer you need to set challenges or you'll never get out of sight of the strip.

**Why not follow Christian Linnet?** There's nobody better for getting you away from the strip to somewhere challenging and quite often (I am not 100% sure of the statistics here) you'll get home. If not, you'll be landing with Christian, somewhere you can get cold beer and/or an aerotow out. For example Sam Clift's strip.

**Fly as late as you can.** There's little quite so wonderful in gliding as whispering home beneath the setting sun, most especially if you already have final glide and there are no

roos on the strip. If you want company, fly along with Atilla. Nobody does it later.

**Fly as early as you can.** At some stage, you may find yourself longing for a 1000 km flight. And if you do, you will have to start early so why not get some practice now. It's rare to launch and find no thermals, so try launching much earlier this summer.

Some years ago, I asked Todd Clark about this and he suggested some good challenges. This is his list.

**Do Roop!** Most gliders are certified for loops. Aerobatics are said to improve your coordination and confidence no end so a loop is something worth considering if you have a

reasonably strong stomach. I did a few loops in a power plane once, while doing some air to air filming of aerobatics. I took me several days to recover, so it's not on my list.

**Fly around Kaputar tower.** This is a fairly cool one for lowish hours pilots. You're only a couple of thermals away from home but the ridge from the Kevlins up to Kaputar is normally reliable. The conditions up at Kaputar can be wonderful with cloud base being sometimes 1000' different across the summit. The scenery is great out that way and there's plenty of low country all around for the nervous.

**Fly east far enough and high enough to see the sea.** This is easier than it sounds. When your eyes are watering with fear, you can kid yourself you are seeing the sea. In fact, Todd says you don't have to go that far at all and it's a good adventure... most of us go anywhere else other than east.

**Visit new towns!** How many times do you want to go to Gunnedah? how about Inverell, Coonabarrabran or Glen Innes for a change? The Warrumbungles and Siding Springs are a fantastic place to fly.

If you want to head north, there are ways of getting up that way without seeing too much tiger country. Bruce Edwards is your man for this. Ask him how. It's also possible that these highland towns look less bleak and uninviting from the air.

**Fly to Narromine or Warwick for a beer and fly back the next day.** Narromine is not that far... 250 km more or less and easy on an average day. Warwick is a bit further and takes a little more planning.

There are plenty of airstrips on the way. There's a bunkhouse at Warwick and at Narromine the motel is close to the strip. It would also stick it to the Narromine and Warwick stay-at-home types.

**Fly up Glen Innes and run the eastern sea breeze front back to Keepit.** Sounds daring, especially since we don't see much of the sea breeze at Keepit. You can tell where the sea breeze line begins on a CU day because the clouds disappear. Bernard Eckey's Advanced Soaring has info on this.

## **SAFETY.**

Safety should always be top of mind when flying but having people continually talking about safety can be a pain in the bum. One needs to get a perspective on the subject. Read this on safety

*A careful operator in good psychophysical condition is the best guarantee of safety. Operating personnel must wear suitable clothing, as required by the safety legislation of the Country where the machine is use.*

That's from an Italian coffee machine.

### **What else is important?**

Everything that is important as well.

You don't get safety quotes like that from Aldi...in fact you have to buy a \$275,000 German CNC machine.

Steve Hedley said 'What could be better than spending the afternoon chasing your mates around the sky.' Not much but still chasing them around in 10, 20 or 30 years time certainly is.

That's my perspective on safety. Fly to be around to fly as long as you want and make sure your mates are going to be there too.

## **WOMEN IN GLIDING.**

Women make up half the population, about 35% of the casual sporting population but only a small fraction, perhaps 5% of the gliding population. This is a notable imbalance and you have to ask why this is so. I think that most of us would prefer that more women were involved in gliding and approve of the improvements at the club to make it more appealing to women.

Hopefully it's a case of build it and they'll come. There's no doubt that as a group, women are more risk averse than men which counts for something. Then there's the blokey attitude problem. I don't believe that Keepit men have a bad attitude towards

women. The club has a great reputation for being friendly and I am sure that this is not just towards men.

We've had three women instructors recently, 80% of my training was with Jenny and Wendy. We've had two excellent women tuggies and though they might have made a ripple in the force, it was not due to their flying ability. They were nice to be around.

So is a 'Blokey attitude' keeping women away? Men do tend to take the piss more than women. The WIG week in Narrogin ad talks about Friendship, Camaraderie, Delicious Meals and Fun, Fun, Fun. Would you get the same words in a male orientated ad?

I suggest you would not, partly because men are a way of too much friendship and camaraderie, most of us being fairly close to Aspergic, a Vegemite sandwich will pass for a delicious meal, and fun, fun, fun probably means watching someone else's wheels up

landing or just counting the bounces. Could we do better here if we want more women members?

Of course women are different. The TV series 'Men behaving Badly' nailed this when Gary asked Neil whether he knew what the difference was. Neil's reply was something like 'Well, women take their jumpers off like this, and men do it like this.'

Anyway, in that spirit the Authorities have prepared an SOP manual for the new women's-only dunny. Before you cry 'discrimination', there are another half dozen loos which they'll only take under protest!

*Have fun, stay safe!*



## KEEPIT REGATTA - 2017

The Keepit Regatta is back!

After a year of absence, the club's most popular event is back again. For those of you who don't know, the Regatta is a relaxed and casual competition, ideal for pilots who are new to competition and those who just like chasing their mates around the skies.

The Regatta is also a coaching event too where pilots can pair up with someone more experienced and either fly in a two seater or lead-and-follow fly in single seaters. Flights are discussed and compared at morning briefing so it's a great way to improve your general flying.

The rules are very simple and the tasks are all Assigned Area Tasks. Team flying and mentoring are encouraged. This year groups will work planning tasks, debriefing and analysing their traces to improve their performance.

At the briefing session each morning, one of the experienced pilots will talk to a topic of interest. We have lined up some good mentors for the less experienced. So come along and learn from the best.

The entry form is now up on the Keepit website. Pilot numbers are limited so get in soon!



# BREXIT NEWS

(AKA Manager's notes)

This season has started a bit on the damp side although there is plenty of flying underway. The place is as pretty as a picture, the lake 85% full and climbing.

We have been fully booked with students, we have had solo's, A certificates, a C certificate, re-solos and a cross country course. The weather has been challenging but we have achieved a lot. *Vic has almost learned to use the Oudie!*



Helping me with all this work is the first of our summer instructors. Michael Harrison, 19 years old, UK assistant cat. Instructor. Checked and tested by Mr Hedley. He has been working his socks off. Michael has competed in the UK junior nationals and is keen to get his behind in one of the Discus.

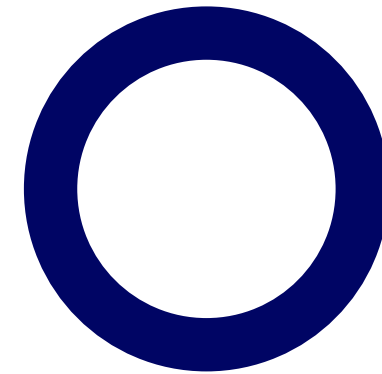
Michael will be with us until end November, after which Mike Birch will return until mid Feb, when he will be superseded by another U.K. Young fella by the name of Jordan Bridge. Also assisting us will be Emil Benson as tuggie (see below). He is also a U.K. Junior glider pilot and he will hopefully join us mid October.



Following the success of Keepit's first XC course for a good few years, I am keen to build on this, facilitating support and further training for those keen to spread their wings. Get in touch if you want to join a course.

With no comps this year this is an ideal time for members to take full advantage of our wonderful facilities and knowledgeable members and give Benalla a real run for their money on the OLC.

The up coming event on 15th October, entitled 'getting to know Keepit' should be a fun event. Come and get involved.



*You know...for gliders...*

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Geoff Sim



**TRIUMPH**





## SAFARI NEWS

After a year of no Keepit safari, there was some discussion about a safari on a grand scale, in keeping with the adventurous goals of the event. A safari which was not just a quick jolly between country towns, something memorable, painting with a Big Brush, something to remember.

What better than to fly from Lake Keepit to Perth and back? It filled all the requirements... ticked all the boxes... big, bold and memorable. In fact, why not go all the way and instead of Perth, cross the ocean to Rottnest!

So, like me, you may be disappointed to know that the projector of this plan was thoroughly rolled at the gathering of the safarians in October. One is tempted

to use the phrase 'big girls' but it's hardly appropriate considering the sizes of the two girls and it being a women in gliding issue of Keep Soaring but all the same... wimps!

Look at that map! It would take a big two seater to get that map on board and the conjones grandes of the pilots involved (of any gender). But what did they say? Roll up that map! It will not be needed... this year at least.'

The current plan is to fly to the rock formerly known as Ayer's rock in my culture. Out of respect for the iniquitous prices charged to anyone who lands an aeroplane at the rock, the intention is to go to King's Station. This is still an adequately bold plan with a total distance of 5,000 km... a little further than the Burketown safari of a few years ago.

Keepit, Nyngan, White Cliffs, Broken Hill, Orroroo, William Creek, Marla, Kings Creek Station is the projected route with a suggestion of dropping in on Robert Smits in Alice Springs to break the monotony of returning on the same route.

Perth and Rottnest... well that's for next year isn't it. (What I don't understand is for a pilot like the pilot formerly known as Mr Gloomy, someone who rates the chance of getting out of bed tomorrow as only 50:50 or less, (and probably only 25% of that) there is not a day to be lost!

Courage mon braves! Gird up your loins! Once more unto the breach, dear friends, once more! Cry 'God for Harry (Potts?), Keepit, and Saint George!'



## GET TO KNOW KEEPIT OPEN DAY

This gala event will be held on Saturday 15 October from 9.30am to 2.30pm. This is only a week away!

The plan so far is:

- The park will open the gates and not charge an entrance fee, to encourage people to have a look at the facilities.
- The Fishing Club will be holding their monthly competition.

- The Sailing Club is holding a “Trash and Treasure” day– giving people a look/experience in the boats and explaining sailing and showing people around their Club
- LKSC will showcase gliding and the club including \$150 AEF flights.
- Brad Shiels has offered the use of a media person Kimberly of Inland Holiday Parks in Newcastle to get publicity for the event.

We’re hoping to do the following on the day, but we will need some specialist skills and help before and on the day.

- Have a glider displayed on the tie down points in front of the Flight Centre, that people can look at / climb into with club people explaining how it works.
- Have a series of video clips of gliding running in the Flight Centre through the data projector for people to watch.
- Have people in the Flight Centre to talk to visitors.
- Open up the Flight Simulator room so interested people can have short supervised experiences.
- Offer AEFs on the day.
- Have a morning tea of scones/cakes and tea and lunchtime sausage sizzle at Bunnings prices.
- Have people watch takeoffs and landings at Terminal 1 or the Flight Centre with club people to explain what is happening.

## SUPPORT YOUR LOCAL MILLER!



The community of LKSC bakers (and there are a few of them!) are fortunate to have one of Australia’s best flour mills right on their doorstep. Demeter Farm Mill flour comes from the Wholegrain Milling Company at 17-21 Borthistle Road Gunnedah NSW 2380.

A good range of organic bakers flour as well as grains and muesli can be bought from the mill in 1, 5 and 10 kg bags.





# CLIMATE TRENDS FOR THERMAL SOARING

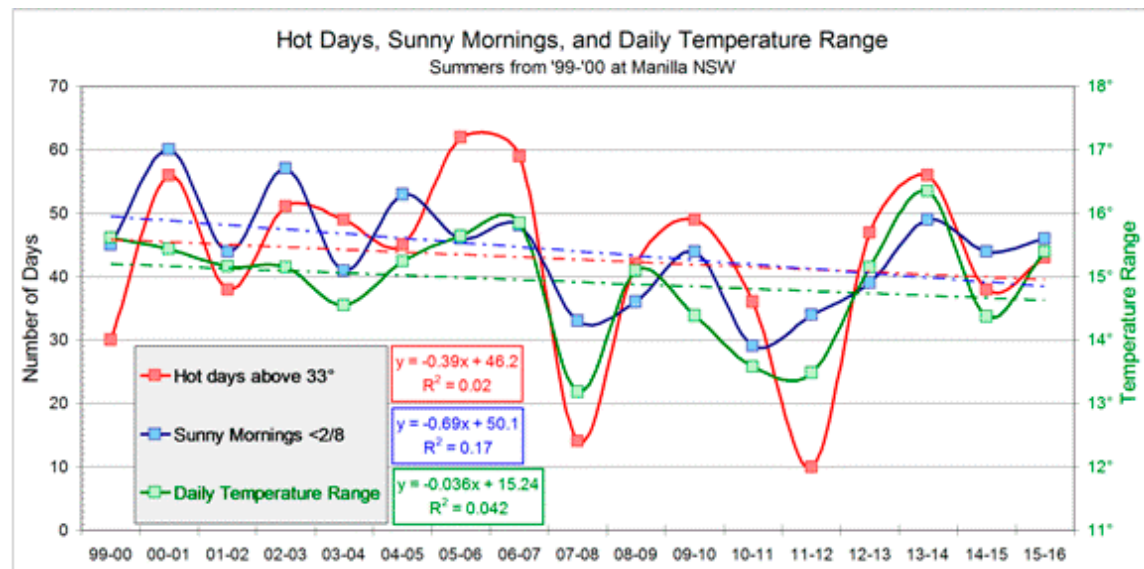
Garry Speight

## Variables relevant to thermal soaring

From my data I have selected three variables that are relevant to success in soaring flight using thermals. I have chosen to use values for summer: a total or average for the three months of December, January and February.

The variables are:

- The number of hot days, when the maximum temperature was over 33°C;
- The number of sunny days, when the cloud amount seen at 9 am was less than two octas;
- The average daily temperature range in degrees celsius.



### Changing values of the variables

The graph shows that each variable fluctuated wildly, with each summer very different from the last. These variables often moved in the same sense.

Two summers had high values of all three variables: 2006-07 and 2013-14. Two summers had low values of all three variables: 2007-08 and 2011-12. I would expect that longer and faster thermal soaring flights would have been achieved in the summers with high values, compared to those with low values.

### Trends

I have fitted linear trend lines, and displayed their equations within the graph.

All three trend lines slope down. This suggests that summer thermal soaring conditions have been getting worse.

I have cited the values of "R-squared", the Coefficient of Determination. All three R-squared values are abysmally low. They are below 2%, which can be taken to mean that more than 98% of the variation has nothing to do with the trend line shown.

You could say that the trends are nonsense, but we are dealing with Climate Change here!

### The future

In the spirit of Mark Twain, we can extend the trend lines forward to where they come to zero:

- There will be no hot days above 33° by the summer of 2118;
- There will be no sunny mornings with less than 2 octas of cloud by 2073;
- Days will be no warmer than nights by 2423.

That last date seems too remote to worry about. However, the daily temperature range will be unacceptable when it gets down to 11°. That is the current summer value for Lasham, England, after all. According to the trend, the daily temperature range will be worse than at Lasham by 2117. That is the same year that the very last 33° day is expected.

### Global Warming

You may be surprised that the linear trend lines fitted to this data set slope downwards. It seems to contradict Global Warming.

The number of hot days can decrease despite a trend to increasing maximum daily temperature. In any case, the rate of increase in summer daily maximum temperature in NSW (1910-2014) is very low: a Bureau of Meteorology graph shows it is only 0.004°/year. That is less than half the rate of increase of (mean annual) temperature in Australia as a whole: 0.010°/year.

The reason I say that the number of hot days may not reflect the increase in daily maximum temperature relates to the other two variables: temperature range and cloud.

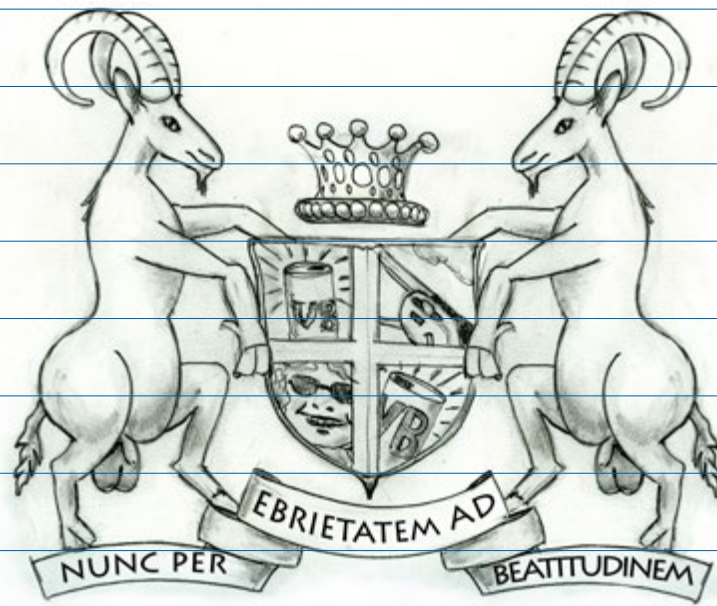
The trend for decrease in daily temperature range on my graph accords with Global Warming data and theory. In Australia as a whole the mean annual daily temperature range in the period 1910 to 2014 decreased at 0.002°/year, while in NSW summers it decreased very much faster: 0.011°/year. I get, for 1999 to 2016 at Manilla, a decrease of 0.036°/year. There is no contradiction there.

Cloud cover varies inversely with daily temperature range. When I observe decreasing temperature range, I expect to see more cloudy days and fewer sunny days, which I do.

The broad idea of Global Warming relates to what is known of the Ice Ages of the last million years. In the Last Glacial Period 21,000 years ago, the climate was about 4° colder than now, and very arid.

Now, in an Interglacial Period, the climate is warmer and more humid. Global warming is expected to make the climate even warmer and more humid. Higher humidity will bring more cloud, just as appears on my graph.

More cloud in summer should prevent very hot days, just as my graph suggests, despite the (small) rate of increase in daily maximum temperature.



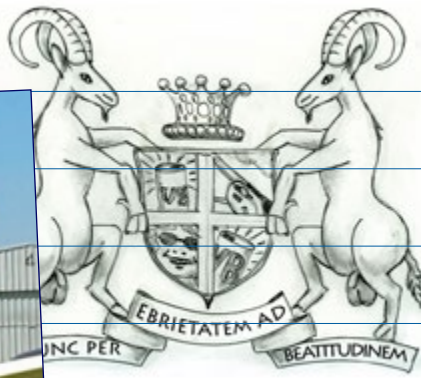
FROM THE  
OFFICE  
OF THE  
PRESIDENT

Mates! I'm reeling!

I'm thinking of chucking in me southerners passport for good and all. I've just found out that they've banned mooning and streaking in plurry Victoria! Worse than that, it's now a crime! Would you believe it? A lot of youse think that it's just Tasmanians who can't muster enough words (with either head hahaha!) to get their feelings across but let me tell you, it goes across the Bass Strait too.

For generations, my ancestors have traditionally expressed their views in public by dropping their daks (those who could afford a pair) and flashing their backsides so all could see their point of view. It's part of my culture! Now half my mates are doing time for practicing free speech.

I'm not that fussed about streaking, not having the physique for it, but I never minded a ~~good looking bird shields~~ member of the opposite gender sex a good streak in a boring game of cricket. NOTE - you don't get boring bits in footy!



That's me, up to my elbows in gliders over maintenance week. You know what it's like, you break a bit, you mend a bit and as long as there aren't too many bolts left on the ground after, it's all good.



As you can see from the piccies, I am pretty much all over it, hands on and all that while some others stood around and gasbagged. And over a simple Peewee!

I don't know what they would have done without me. Borrowed tools and tape and paint and screws and kept badgering Grant from Keepit Glidertech for a quick fix as usual I guess.



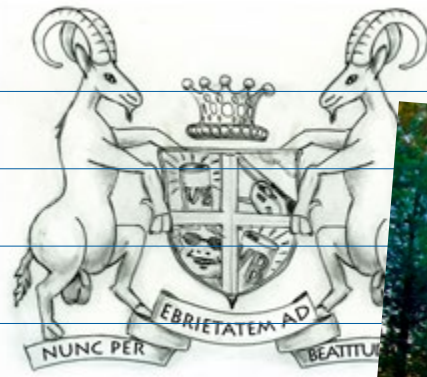
It seems like a lifetime ago that our last summer tuggie went home. Here's a snap of her, typically wondering why the blokes are sitting on the ground fiddling with instruments when they could be going flying.



Actually, our blokes did plurry well in some GFA fest they had down south a month or so ago... that's to say when it's so brass monkeys in Melbourne that no sane person goes south.

Tim Carr got a gong for Top Tyrant or some such. Harry Medicott got one for inventing the FLARM (like Our Malcolm invented the internet eh!) which Dave Shorter picked up, making it look to the southerners as if Keepit was getting all the attention and the editor of this rag got something too... now his head's too big to fit in the cockpit of his glider! And contrary to his hopes, getting an award does not come with a free pass on AFRs for a year.

You may have seen that we have new dunnys up near the gyppos swampies travellers camping area. If youse want opinion, we must be getting soft! The dunnies are better than the accommodation in lesser clubs! (I guess we can let them out to visitors during comps etc.)



have some



Those of youse who can count or read the signs on the doors will have seen that three are for blokes and birds (one at a time I hope!) omni-gender and the other is not. That one's reserved off limits verboten and most of youse can't use it at all unless you get the snip if you are a bloke:

Now I don't know about you lot but there's a lot of shouting discussion chez moi about the dunny, or specifically the dunny lids. I'm bugged if I can remember from one leak to the next what the rules are, so the committee and the GF&A have got together and written some rules so youse all know what to do and what not to do. I just hope your memory is better than mine cos the rules keep changing it's easy to get the rules wrong. And if you're going at night, use the bushes don't wait until your legs get splashed turn on the light!



**Editor to Qualified Technical Correspondent:** *During a recent week of secret safari business I watched an aircraft takeoff below, blissfully unaware of our gaggle transiting the area, some god forsaken desert to the west of Broken Hill. It got me thinking, how many noisy affronts to soaring flight am I not seeing? If I wanted to see them, what would I fit to my glider? And what if I wanted them to see me?*

**Qualified Technical Correspondent:** I'm much more willing to tolerate these powered folk from a distance, even more so if we've exchanged how do you do's and discussed who's doing what beforehand. They don't offer sheepskin in brown for nuttin'! But, I digress.

I recently had a similar experience in the NSW state comps. On a final glide that passed to the north of Gunnedah, I tuned to CTAF frequency and heard a news helicopter and an aeromedical King Air negotiating who would depart first. Thinking I had some time before I had to deal with the 4,000kg aircraft climbing at 250kts, I returned my attention to the fastest finish I could muster.

I was wrong, the next glance at my PowerFlarm showed rapidly climbing traffic on a collision course. As I went about broadcasting my position and turning to create lateral separation, he levelled off 2,000ft below me, before I could even finish my sentence. He'd seen my transponder and self separated vertically. His reply to my radio call confirmed this and we both went on our merry ways. Happy days!

Now, I'm going to don my techno hat in a minute so before I go full geek on you, I better define some equipment types.

**Transponder** - Airborne equipment that replies to radar interrogations with a discrete code (for identification by ATC) and altitude. It turns an aircraft on a radar screen from an indiscriminate 'blip' to 'QF2012 5,500ft 250kts tracking 090°'.

**Mode S Transponder** - In addition to the above, can add extra data to its signal, allowing the use of 'Automatic Dependent Surveillance - Broadcast' (ADS-B).

**ADS-B** - The next generation of traffic surveillance. As conventional radars are prohibitively expensive to install and maintain, ADS-B was devised to extend monitored air traffic services to a greater area at a lesser cost. ADS-B relies on an aircraft broadcasting its identity and position (using certified GPS data) amongst other things, to ATC.

**PowerFLARM** - The next generation of Flarm. In addition to glider to glider alerts, PowerFLARM will provide collision alerts for transponder and ADS-B equipped traffic. That's virtually everything, from a Cessna 152 to a Boeing 747. If you have a moving map PNA or a compatible display such as LX's FlarmView, you'll see them long before they're causing the collision alert algorithm to wail like a Banshee.

**TCAS** - Traffic Collision Avoidance System or 'PowerFLARM for powered aircraft'. This is a certified and very expensive product, not just warning pilots about collision risks but coordinating responses between similarly equipped aircraft to prevent collisions. This is generally mandated for all turbine aircraft over 5,700kg MTOW or 19 passenger seats.

**TABS** - Traffic Awareness Beacon System. An under-development technology that may bring TCAS-like performance at much lower prices (\$4-600). Driven by

the proliferation of drones entering the sky, it's seen as a way of offering collision warning and avoidance with equipment that doesn't meet (need) ATC's position integrity requirements and the prohibitive cost that entails. Some powerful players with vested interests such as Google are driving the development.

So what should you fit to a glider? At the very least, PowerFLARM. It will let you see all Flarm equipped (gliders), transponder & ADS-B equipped (GA, airline & Air Force) traffic. It is self-contained, can be mounted remotely, and automatically turns on with your master; a set & forget solution. In addition to the collision avoidance benefits, seeing the location and altitude of gliders around you really adds to the fun of both safari, comps and weekend flying.

A PowerFLARM starts at \$2,300 with added functionality available at incremental cost. These add-on's include .igc recording to diamond level, activation of a second antenna, ENL recording and built-in audio output. The budget conscious may like to monitor US gliding forums for second hand sales but they're popular and thus go quick.

US PowerFLARM's are useable in Australia but those from Europe are not due to operating frequency differences. Note that a PowerFLARM only allows you to be seen by another Flarm, whether it be Classic or Power.

**If you want to be seen by most of powered aviation, a transponder is the only way to achieve that.**

In the not too distant past, transponders were power hungry devices that glider batteries were unable to satiate. On this basis, the GFA was granted an exemption to the requirement for gliders to fit transponders for use in controlled airspace.

Fast forward to present day and technological advances have lowered transponder current drain to below 0.3A and the physical footprint to around the volume of a can of coke. Remote-mountable units such as the Trig TT21/22 allow the 'brains' to be mounted where you have space and the panel only has to have enough space for the control head, a 57mm friendly part that's only 54mm deep.

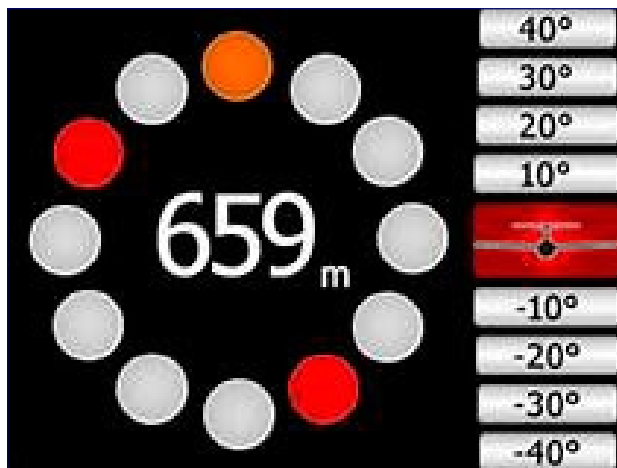
You could go the Full Monty and install ADB-B out if you wished but to be honest, I don't know why you would. Benefits to gliders are only in exceptional circumstances, none of which apply at Keepit. As ATC will ignore your position unless you spring for a certified GPS source, it's a \$3,000 option that just can't be justified.

Finally, national regulators such as CASA are currently working on defining standards for TABS. In the near future, it's hoped this system will provide a cost effective collision avoidance solution to gliders, GA aircraft and drones as ATC's insistence on precise GPS position information is preventing the potential collision avoidance benefits from being realised.



The following table summarises the benefits of each system:

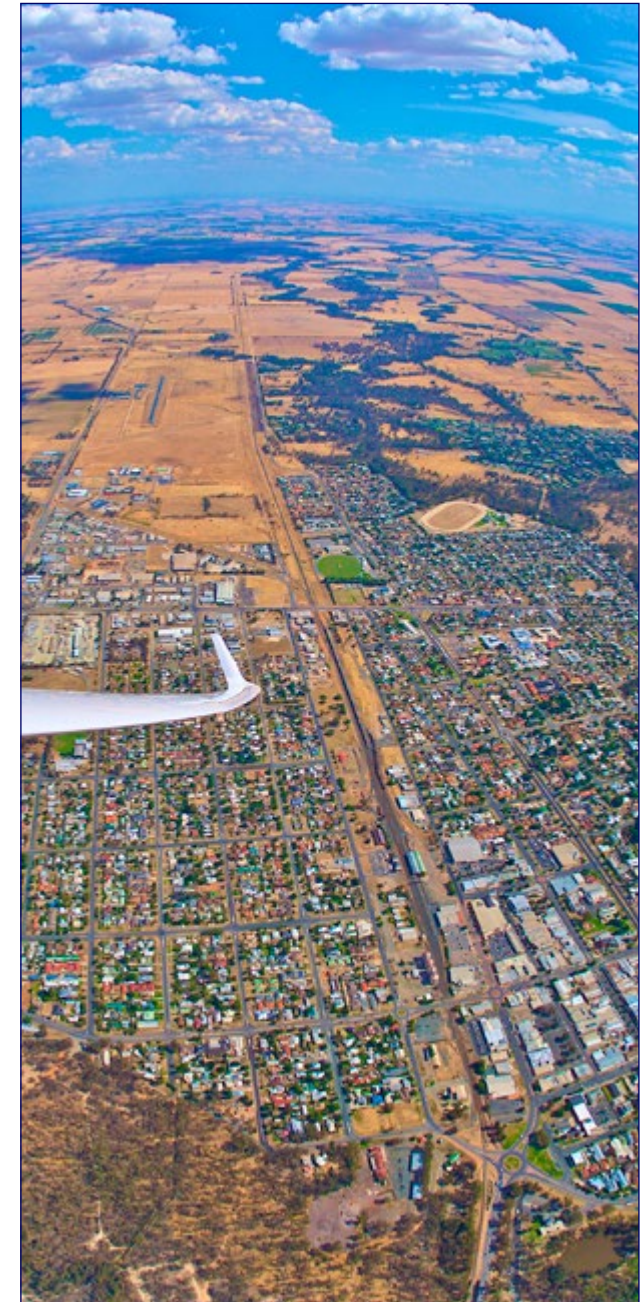
		Who you can see		Who can see you		
		Gliders	Powered	Gliders	Powered	ATC
Receiving & Transmitting equipment	Flarm	Yes	No	Yes	No	No
	PowerFlarm	Yes	Yes	Yes	No	No
Transmitting equipment	Transponder	No	No	Yes*	Yes^	Yes
	ADS-B	No	No	Yes*	Yes^	Yes



The 'classic' FLARM display gives you a reasonable amount of information fairly fast. There are threats at 10 o'clock, 5 o'clock and another at 12.



The FLARM view display, shows you the positions of each threat but it takes a lot longer to view and understand the situation just when you should be looking outside.



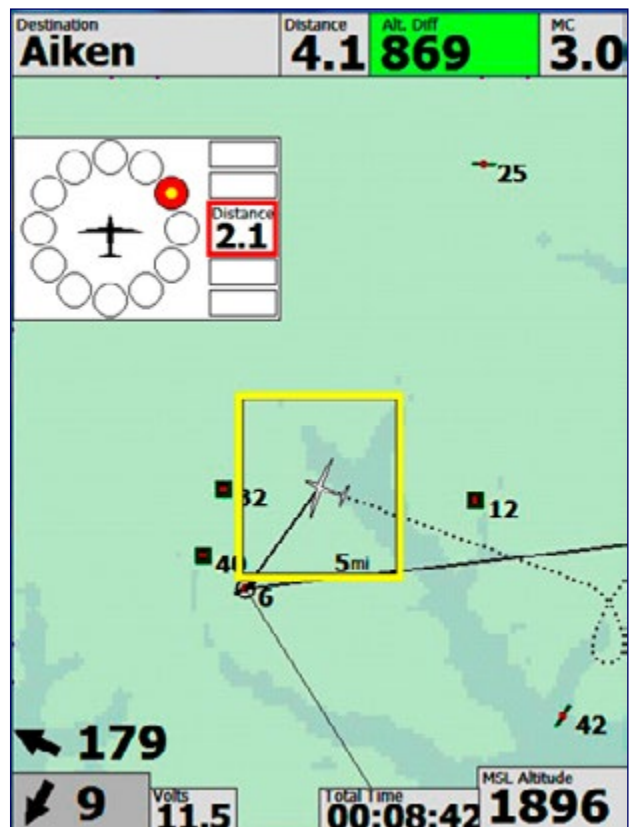


Like other glide computers, the Oudie display shows FLARM equipped gliders as symbols, tagging their distance and rate of climb in a white rectangle.

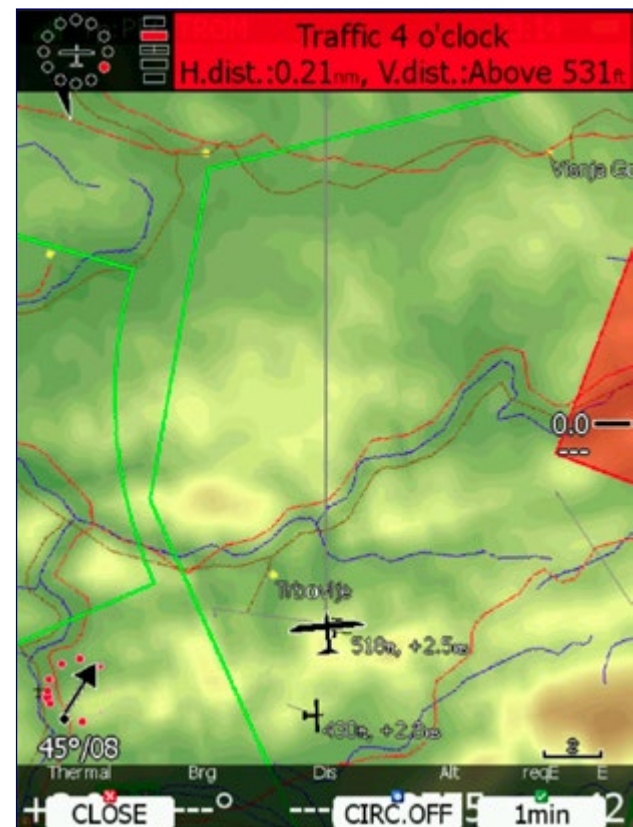
Gliders which represent a threat are shown red but there does not appear to be more information shown on this screen and presumably a separate FLARM display is required.

Whether, in bright sunlight with the Oudie mounted in a glider cockpit, you can read any more than the rough position of the glider is doubtful.

The tag is useful for checking the rate of climb of a nearby glider in a thermal but not much good for collision warning. And if there's no emergency which needs action, you can normally compare another glider's rate of climb fairly accurately by looking out of the window.



The Clearnav display has an integral FLARM display while the LX display uses a combination of warnings on the main screen and on an external display to show FLARM threats.



On LX displays, the main screen is used to show immediate threats and there's normally a separate classic FLARM display on the panel. On upgraded LX instruments, there is a voice warning which replaces the FLARM beeps. The voice is a great alert though the information can be difficult to absorb while you're checking the outside, the FLARM and the main screen to see where the other aircraft are.



Powerflarm will let you see all Flarm equipped (gliders), transponder & ADS-B equipped (GA, airline & Air Force) traffic. It is self-contained, can be mounted remotely, and automatically turns on with your master; a set & forget solution.

Powerflarm claims to extend the range of the FLARM signal. The base unit can be extended with various extra cost options including audio, a second Flarm radio as well as certified IGC and ENC.

Powerflarm looks like a good idea if you want ADS-B, transponder and Flarm reception and you have a display (LX, LNAV, Oudie, Clearnav etc) which you can use to show this information. It's a fairly expensive option though, costing over \$2300 for the base model.



The TRX-1090 is an interesting option if you already have a satisfactory Flarm setup. Flarm signals are amplified by the TRX-1090 to give an extended range. If you have a compatible display, the TRX-1090 will also show transponder and ADS-B traffic. The

Like the Powerflarm, the TRX-1090 can be placed remotely and turned on and off with other instruments. The TRX-1090 has EASA minor change approval for almost all gliders so it can easily be fitted to certified aircraft. The current drain is a low 130 mA. The TRX-1090 interfaces with Garmin devices at no extra cost.

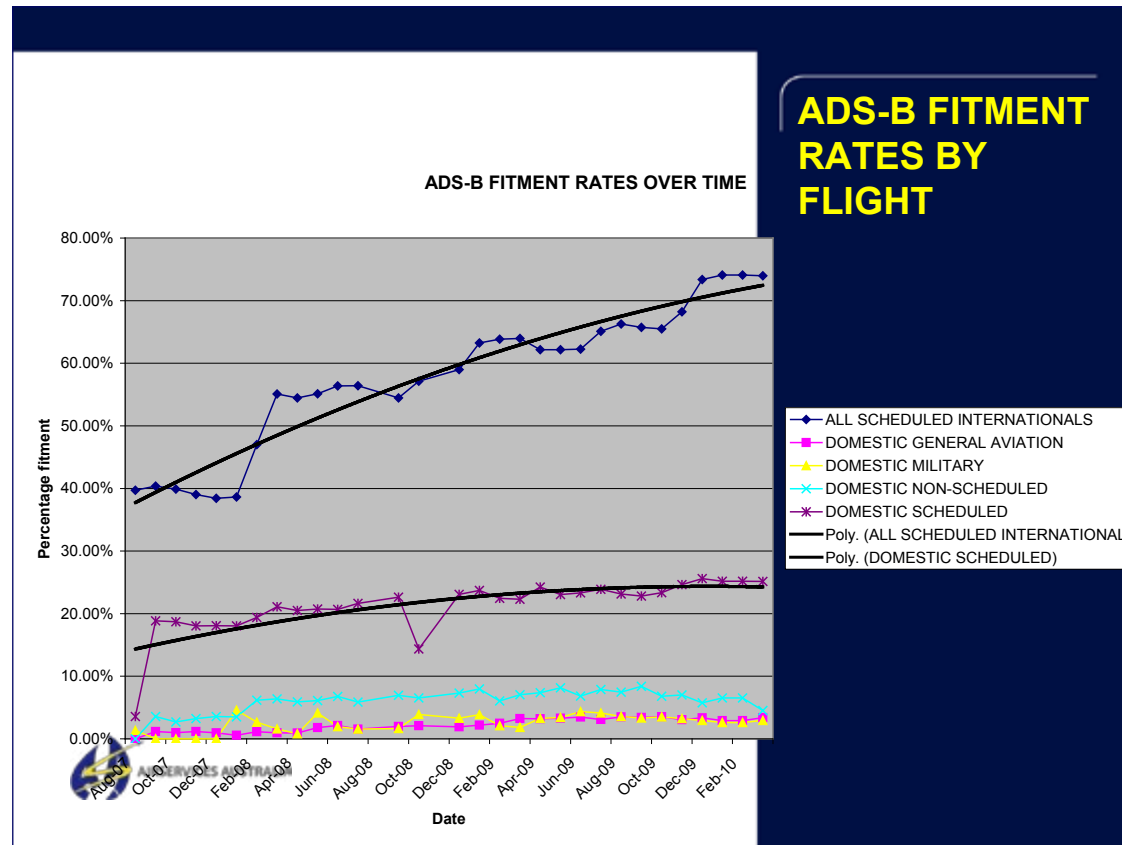
If you already have the Flarm, the Flarm and GPS antennae then the TRX-1090 costs under half the price of the Powerflarm.



The TRX-1000 is the smallest and lightest aircraft ADS-B receiver on the market. Flarm signals are amplified by the TRX-1090 to give an extended range. and the unit can track up to 8 ADS-B aircraft simultaneously. With a system-weight of 42g and a current draw of 50 mA, it can be used in any aircraft. The TRX-1000 also interfaces with Garmin devices at no extra cost.

The TRX-1000 does not appear to receive transponder traffic.

The TRX-1000 is very low cost, around \$450.



## ADS-B FITMENT RATES BY FLIGHT

**Editor to Qualified Technical Correspondent:** *The nasty graph above suggests that only your mates are going to have ADS-B and the GA lot are going commando!!*

**Qualified Technical Correspondent:** Yup! Though ADS-B will be mandatory for all IFR aircraft by.....2019? I'd have to check that date. That still leaves all the VFR aircraft (private, airwork, flight schools, etc).

Sorry for the brief, point form reply; getting married tomorrow. Toodley pip!

**Editor to himself.** *Damn! That's bad news. Not the wedding business but the fact that half the people out in our airspace are invisible!*

Not only are they invisible, the line of the graph tends to suggest that it will be 2423 before the number

of GA aircraft fitted with ADS-B are enough to warrant fitting something so you can see the small ones.

By then, according to the 99.493% accurate forecasts of Garry Speight, nights will be as warm as the days and we won't be flying at all.

Albuts, can you use fitment like that? It may be correct but it's certainly ugly!



## GETTING LOW .... UGGH!!

*Dave Shorter*

You're on a cross country task, racing your mates ... it's a great day, 5-6 knot thermals with the occasional 8 knotter ... and you fall in a hole. Down low and struggling, no bumps or buoyant air. How depressing!

How did this happen? See all the other gliders zooming past, distant specs way up above! What did I do wrong to get into this desperate situation? Look at those guys up above. I should be up there!

Sound familiar? Been there? How did it feel? Depressing, frustrating, annoying, bloody annoying. Feeling demoralised? You betcha. I've been there, done that, and understand how frustrating, annoying and demoralising it can be.

Imminent outlanding a pretty good prospect. What do we do now? How do we get out of this seemingly desperate situation?

When I told my wife I was writing this, she said "You know a lot about getting low." Rather cynical I thought .... she was talking with the voice of experience, having collected me from many paddocks.

However, maybe I've learnt a bit more now, and here are a few things you can try.

I suggest also you pick the brains of some of the weak weather specialists in the club. Ex hang glider pilots get to know what works on the ground. Jenny Ganderton is masterful at getting home late in the afternoon. Alan Barnes and Attila Bertok, ex-hangies also know a thing or two. And Harry Medicott has a wealth of knowledge from his early morning starts when convection is very low.

Firstly, understand that it happens to us all. Forget the recriminations – stop punishing yourself for getting into this situation. It's not the end of the world, nor need it even be the end of the flight.

Stop worrying about what you did wrong to get into this hole. Forget the gliders sailing past way up there. Settle down and move into survival mode. You're going to find something to get you out of this situation. Think positive. If you think you're going to outland, you will.

It goes without saying that you've already made sure that there are safe landing paddocks within reach. Not only that, but you're going to keep searching ahead, so there'd better be safe options ahead.

The further you can go forward, the more air you can search, the more possibilities of lift you'll cover, so

you want to have a progression of safe landing options ahead.

Remember also – safe speed near the ground. If you’re getting low, keep thinking “Safe speed near the ground, Safe speed near the ground”. So important. You can’t afford to inadvertently stall or spin down low.

Depending on your height, you might even put your undercarriage down – if you’re scratching down low at circuit height, that’s one less thing to have to worry about if you finally have to abandon your search for lift and land in that paddock.

So how do we find that saviour thermal ... (or even some buoyant air, please!)

Forget clouds. It’s ground features you have to concentrate on. Start thinking like the air. “If I was a bundle of hot air, what would persuade me to leave my warm comfortable layer on the ground?”

You need to find something which disturbs the air, that forces the air to start moving up. Here is a list of some of the ground features that may be worth trying.

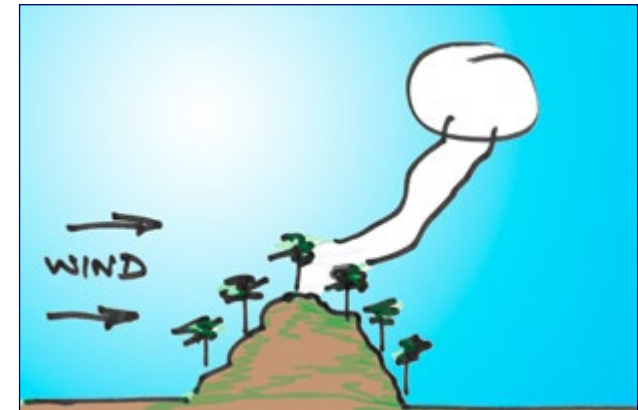
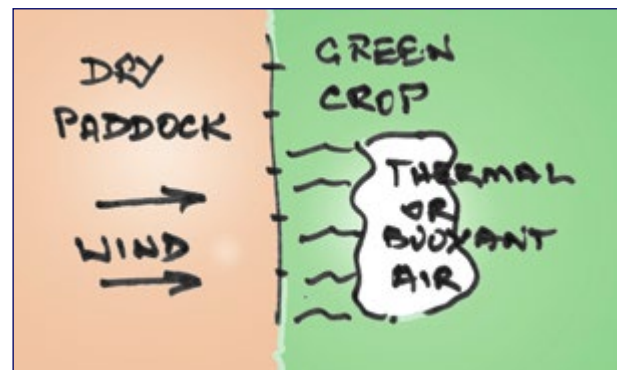
*Most importantly*, know the wind direction on the ground because that will help you know where to look as your thermal will drift downwind away from your ground features.

Always explore downwind from these features.

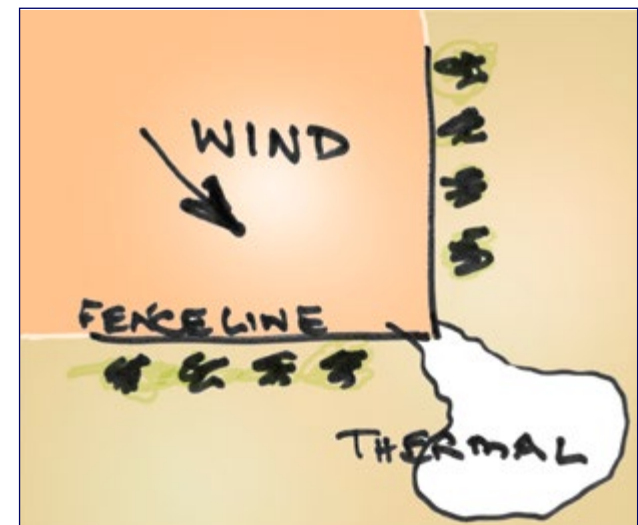
- Changes in ground texture are always worth exploring.
- The edges of fields and changes in crop colour.
- Lines of trees along roads, or edges of paddocks.

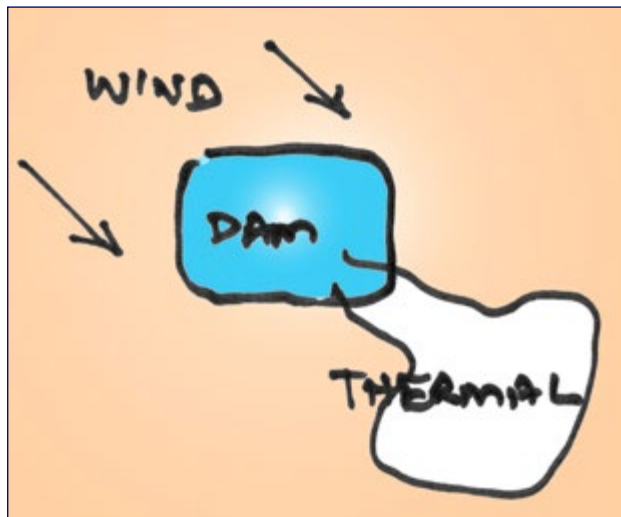


- Rock outcrops.
- Clumps of trees, often trees are left on small rocky hills, and the hill forms a trigger point.



- Particularly look for lift in the corners of paddocks edged by trees. If there’s a breeze blowing across the paddock, the trees in the corner form an obstruction which the lower layer of warm air must lift over. Once it starts rising, it keeps going.





- Tractors, harvesters – farmers harvesting normally disturb the ground layer and trigger rising air.
- Often you can see a pall of dust rising from the paddock being harvested.



- Dust devils – very often too low to be useful, but dust devils well ahead may be high enough when you get there, particularly if they're being blown across a

paddock towards trees.

- If there's wind, the lift will be offset downwind.
- If conditions are dead still, and paddocks are featureless, something moving may stir up the hot air.
- Highways with traffic, cars trucks.
- Burning ground, fires. Smoke is the rare instance of a visible thermal.
- Birds circling.
- Heavy sink can also be the precursor to a strong thermal – it may be right alongside you, or just ahead.
- Late afternoon, when the paddocks are cooling down, patches of trees, and forests give up their stored heat.
- Rivers later in the day can have a line of buoyant air running along above them.

If you find buoyant air, and there are no obvious ground features running across wind, then turn to fly upwind.

If you find buoyant air coming off a line feature (like the edge of a forest, mountain, line of trees or roadway) fly parallel to the line feature.

The important principle is to try as many features and possibilities as you can think might work. Even if most of them don't, you increase the probability of finding lift by flying over these features, compared to just pressing on without thinking.

There's another golden rule – don't turn back. The air you've just come through was no good. Don't fly through it again. You must keep pressing on to sample more air, and try more possible trigger features.

If you're low enough, you take anything! Half a knot is pure joy if you're at circuit height. In fact, at circuit height it's probably worth circling in half up/half down – so often that will develop, ever so gradually if you hang in there, and finally you may climb away as a thermal consolidates.

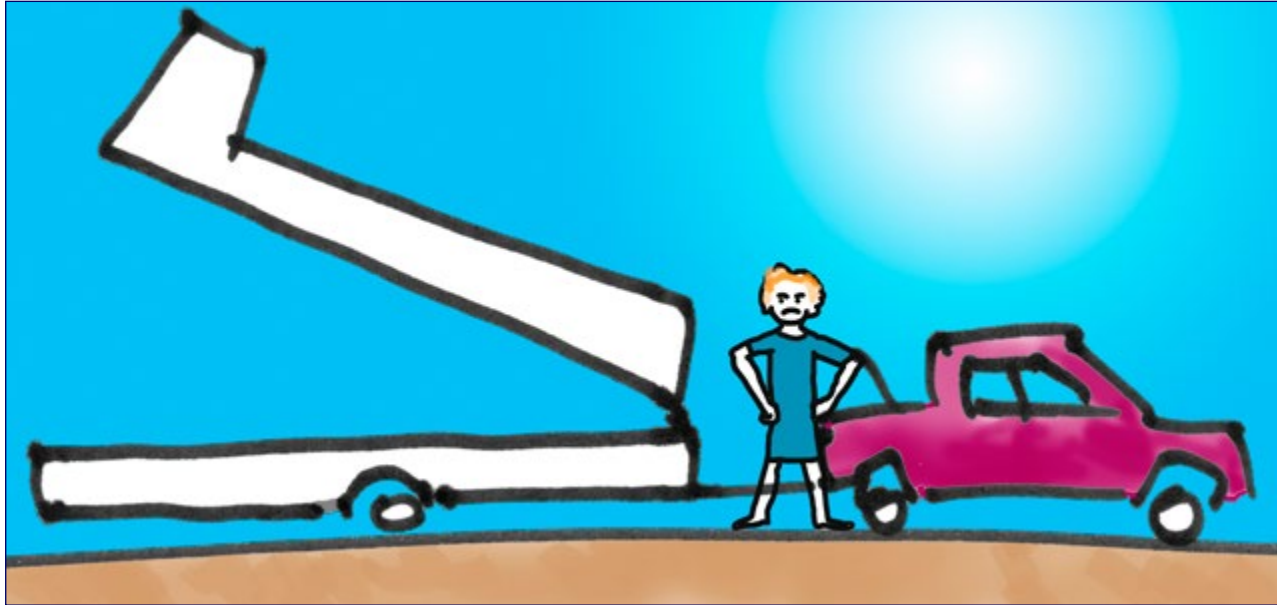
Generally, if you take a weak half knotter saviour thermal, one of three things happen –

1. It disappears. You lose it. Goddamn it where did that go? You may try and find where it went. The best option is probably to try flying upwind. If nothing eventuates, get back to your search for other lift.

2. It gradually but steadily builds in strength. You're saved. Home and hosed. Hang in there and ride it to the top. This normally happens as a number of different streams coming off the ground flow together and consolidate into one good thermal.

If the lift builds to what you would have expected as a typical thermal strength for the day, stay with it. You're in luck. Getting a strong thermal from down low is the best result you can ever hope for, as you get one long strong climb.

3. It stays weak and insipid – half a knot, maybe one to two knots. Having been so low, and struggling



there is a temptation to hang in and get back to the lofty heights where you were before.

Getting low is demoralising, and can upset your confidence. You don't want to leave this nice comfortable thermal that has saved you from an imminent outlanding. BUT, staying with this thermal would be very costly.

Climbing at one knot will take 20 minutes just to regain another 2000ft, let alone get back to cloudbase, and perish the thought of staying in half a knot for climb back to cloudbase.

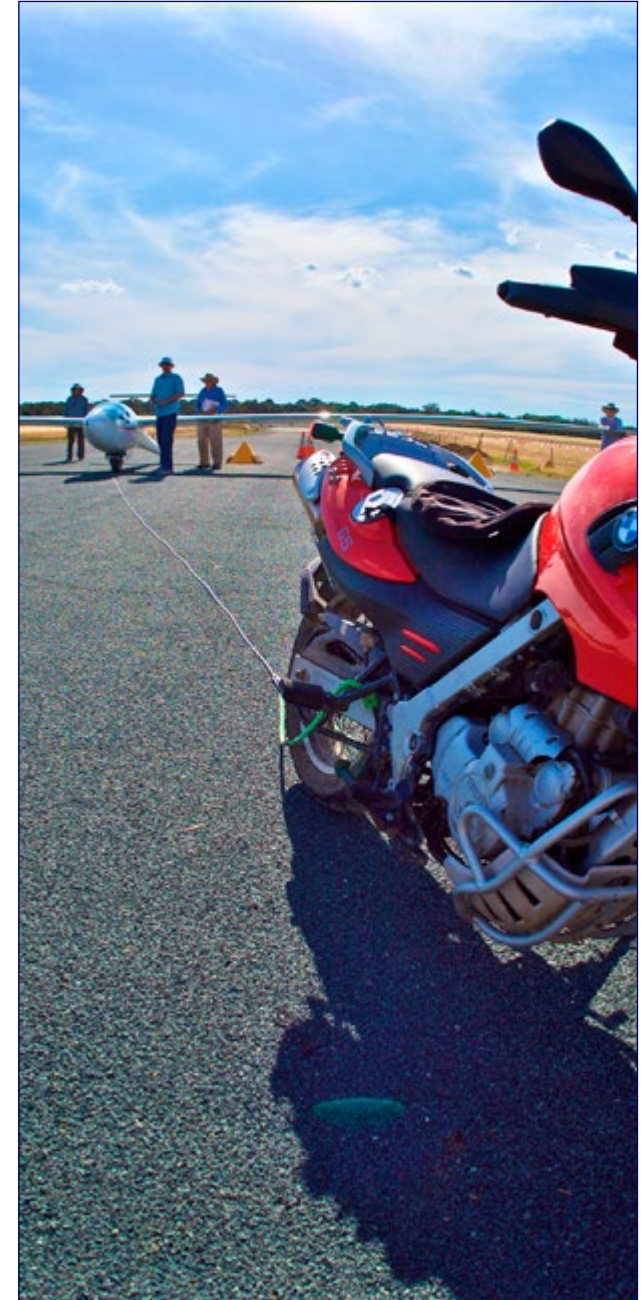
Just getting an improvement from 1 to 2 knots will be a vastly better result. So in this situation, as soon as you gain a bit of safety height, maybe another 500ft, push off and find something better.

I've been surprised how often I've found something vastly better just another 500 metres or so further upwind, just waiting for me all that time.

Getting low needn't be the end of your flight. Getting to understand the possibilities, and knowing what features will generate that saviour thermal is the secret to staying in the air.

However, if nothing works, remember to turn off, stop scratching around, make the decision to land and concentrate on a safe landing in that paddock you've had in reserve all this while. And don't forget your FUST check.

Good luck.







There are few faith-based activities or sports. Perhaps only trapeze acts, the high wire and gliding. Certainly there are few sports which rely on faith in the invisible as much as gliding. We turn in an invisible mass of rising air and our glider rises, that much is sure.

But where we turn and how we turn is based very much on faith. Faith that our mental picture of the rising air will turn out to be correct. But what if this faith was a delusion?

Towards the end of last season, Jenny Ganderton proposed a 750 FAI triangle from Keepit to Lightning Ridge, Collie and then Keepit. It sounded like a great

idea. I had already formed in my mind the pattern than when Jenny said it was a good day for a fly, it would be. So off we went, and early too.

Note: Jenny and I are both ex-hang glider pilots. Apart from meaning we have a short attention span, this means we are used to looking downwards for thermals and (according to Dave Shorter) have an inherited advantage when flying low.

Because of my short attention span, I normally head off on task as soon as I have topped out in the first thermal after launch without waiting around for other gliders or to assess the day.

Leaving early, you're bound to be leaving low and it's probably advisable to head towards possible convergence on the hills and follow the high ground of the Carrols and the Kelvins towards Kaputar by which time the day should have sorted itself out.

However, the need to get going got the better of me and like Lord Nelson I thought 'Bugger tactics, aim straight at 'em.' So within a short time I was looking hard for an outlanding spot towards Gunnedah having found nothing on the plain. As I grovelled, I could hear Jenny and Trevor West on the radio, getting great climbs on the hills and leapfrogging past me.

Trevor does radio calls like that rather well.

Of course, I did all the things one would normally do under those circumstances... turned down Trevor on the radio for a start and then concentrated on looking for suitable thermal triggers on the ground close below.

I covered all the classic ones. Dark fields, tractors, divisions between dark and light, farm houses... you name it, and scratched around for ages getting lower and lower until, while I was in full outlanding mode, I finally blundered into some lift.

I slowly got back up to probably 3000' AGL but it felt like 15,000'. Within 10 minutes I was having another anus-clenching moment close over the hills where instead of escaping towards the safety of the plains, I headed towards a wisp of cloud swirling in the opposite direction, the valley of terror... but that's another story.

While I was grovelling over the plains, I was acutely aware I was doing pattern recognition. Trying to match the available sensory information to some memory, either of a previous low save or got from reading or talking or listening to others.

Pattern matching saves time. It allows your brain to short-circuit the thinking process and make decisions at a very rapid rate. Very useful if you are overloaded.

I was highly focussed on finding rising air, scanning the ground all around, looking for something which

might be a thermal trigger while at the same time evaluating outlanding sites towards Gunnedah airstrip. Because I was in a self launcher, I was also doing checks in preparation for raising the motor.

Twenty thousand years earlier, I might have found myself in a similarly hyperactive state, looking for some bush which might contain dinner, furry or fruity.

What I was doing in the glider was what I had evolved to do... making rapid decisions about a number of things, without actually thinking much about any of them. Visual and audible patterns taking shortcuts to action.

Pattern recognition is what we do best. Connected with muscle memory, pattern recognition allows us to act faster than the speed of thought.

Throwing a spear or bowling a ball, the thrower cannot think fast enough to control the exact moment where the missile is let go, but short circuits like muscle memory allow precise but unconscious thought and action. The release point, though unconscious, is uncannily accurate.

#### **But sometimes we get it wrong..**

"The human tendency to see patterns that do not actually exist is called apophenia. Examples of apophenia include the Man in the Moon, faces or figures in shadows, clouds and in patterns with no deliberate design, such as seeing the face of Jesus in the browning on a piece of toast or the top of a jar of Vegemite. We

have the perception of causal relationships between events which are, in fact, unrelated. Apophenia figures prominently in conspiracy theories, gambling, misinterpretation of statistics and scientific data, and many kinds of religious and paranormal experiences. Misperception of patterns in random data is called pareidolia."

There's a word which comes from the world of bullfighting which is fairly apt here; *querencia*. The word means the safe spot. The place the bull goes because it feels secure, probably because it gored a matador earlier. Of course the *querencia* is pure superstition. A lot of us continually use *querencias* when flying.

Richard Dawkins has something to say about this: "A gambler habitually runs, after placing his bet to a certain tile in the floor where he stands on one leg while watching the race on the bookmaker's television. Presumably he once won while standing on this tile and conceived the notion that there was a causal link.

"We are not the only animals to seek statistical patterns of non-randomness in nature, and we are not the only animals to make mistakes of the kind that might be called superstitious."

The American psychologist B F Skinner made a career out of studying the relationship between statistical analysis and superstition.

In one experiment with pigeons, he cut the causal link between behaviour and reward and set up an

apparatus to "reward" the pigeon with food from time to time no matter what the bird did.

Now all that the birds actually needed to do was sit back and wait for the reward. But in fact this is not what they did. Instead, in six out of eight cases, they built up - exactly as though they were learning a rewarded habit - what Skinner called "superstitious" behaviour.

Precisely what this consisted of varied from pigeon to pigeon. One bird spun itself round like a top between "rewards". Another bird repeatedly thrust its head towards one particular corner of the box. A third bird showed "tossing" behaviour, as if lifting an invisible curtain with its head. Skinner's superstitious pigeons were behaving like statisticians, but statisticians who have got it wrong.

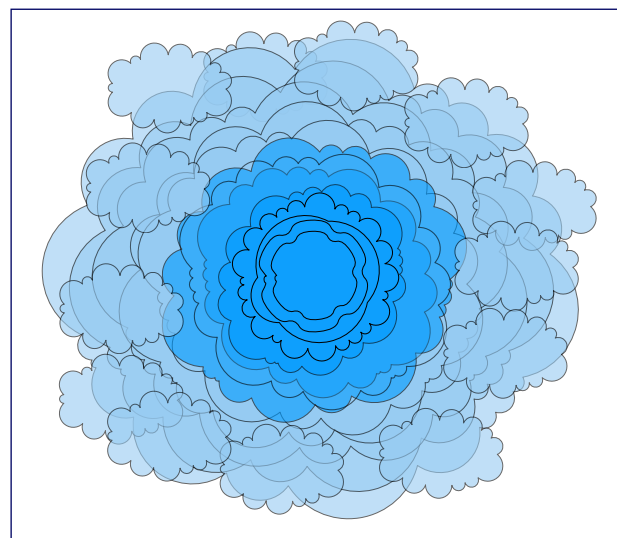
**Perhaps we glider pilots have got it wrong... at least enough of the time that we could call a lot of our behaviour just plain superstition.**

Thermals and gliding in general, was invented by the Germans by nature a scientific and ordered mob. Fairly early on in the process, they flew gliders into clouds and thunderstorms to find out what was happening and to document and categorise what they found. This was not a question of *Macht Spaß* so much as to increase the *Summedesmenschlichenwissens*. Many pilots died and perhaps as a result, these findings were considered as sacred as the ten commandments.

We have all read reams on thermal structure from writings which started seconds after the birth of gliding. We have studied drawings, perhaps dozens or hundreds of drawings of thermals, so we know exactly what they look like and how to fly them.

It's a surprise then, that there are so many days which don't really conform to these learned patterns. What if our innate ability to sort events into recognisable patterns was finding shapes and patterns which did not exist? Have you actually seen a thermal?

There are "classic" thermals which feel a little like the drawings. I've had a few. A very few indeed. Hans Killer states that less than 50% of thermals conform to the DIN standard classic thermal and that's certainly my experience. The majority of thermals then do not conform to any defined shape other than that there's a mass of air moving more or less upwards.



"Classic" thermals have a single core which you turn in at a mathematically precise speed and angle of bank, shifting your turning centre from minute to minute, until your climb rate slows and you leave. But often, very often, you'll find more than one core.

The core may be in the form of a column topped by a cauliflower-like cloud on top. It may be in the form of a bubble, a pulsed stream of bubbles, a doughnut, a three or more legged stool.

You may lose what you think is the core and find another a few hundred metres away. Definitely not the same core as before but a second core going into the same cloud. In fact, Hans even gives a drawing on how to fly the three legged variant.

So many thermals, so many variations. At what point to we abandon the idea of a classic thermal and think in terms of chaos?

The "classic" thermal diagram has thermals spaced more or less evenly across the ground. But we're told that one in eight possible sources or clouds will be working at any one time so we don't expect any regularity.

**What we expect has the pattern of chaos.**

We're told that the core of the thermal will meet a cloud in the middle, or off to the windward or leeward side or off to the sunny side and we obediently aim for these places when we reach a cloud. If we don't find anything, we move on, swearing or otherwise, but never doubting that there's a pattern somewhere, if only we can find it.

If we find a pattern, for example that the thermals are on the sunny side of the clouds, then we religiously look for a thermal in the same place on successive clouds. Most books and articles on thermals will sprout this.

Experience shows that many clouds don't work. They may be marking thermals, but by the time you have got there, there's nothing. Some days, most clouds just contain sink and lots of it but in our mind, we think that this is probably because we have not yet understood today's thermal pattern.

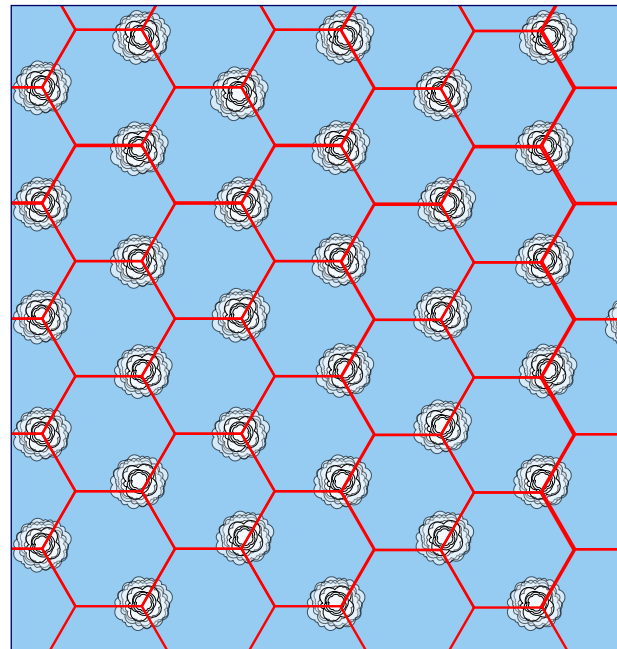
Yes, today's pattern because we're also told that the pattern does change each day. And it may change through the day too.

We're told that thermals occur in hexagonal patterns. Some French dudes went to the Sahara to study clouds and *"The desert they studied was covered with small sand dunes and there were no other significant features."*

*"The sand was a uniform colour and there were no mountains or hills to form or trigger thermals. When the atmosphere was unstable the thermals still set*

*up in the way you would expect, but they had some rather astounding conclusions. They concluded that in nil-wind conditions, the thermals form along the edge of hexagonal patterns.*

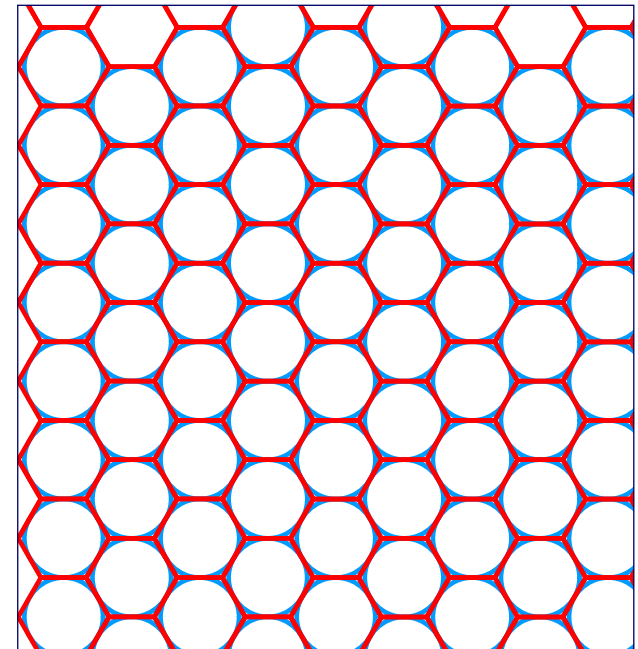
*These hexagons are regular in shape with the length of each side being 6 km."*



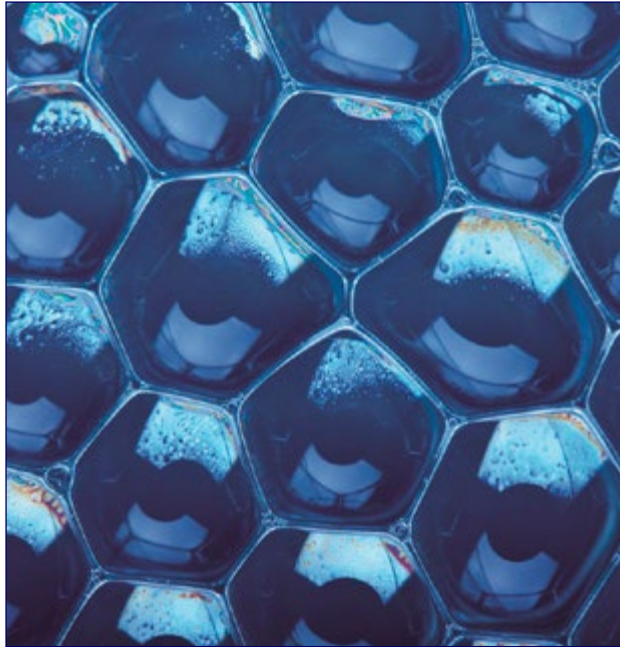
The above picture shows real clouds with a superimposed set of regular hexagons with edges of exactly 6 km to illustrate these astounding conclusions.

In fact, thermals may be spaced in hexagonal patterns in completely even heating and zero wind conditions... that's to say in a laboratory saucepan. The reason for this is moron-simple.

Assuming the thermal is more or less round, then the closest packing you can achieve with circles is with the centres spaced in a hexagonal pattern like a stack of pipes or ball bearings. However, one must assume, in the case a fluid like air, that the circular shape must be varying in diameter as the thermal forms and dies.



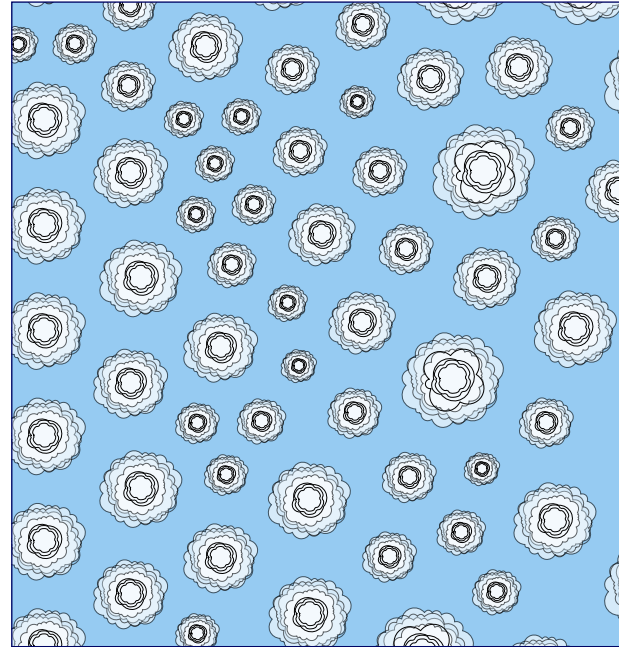
If you accept that presumption then the above diagram merely represents the average circle of influence of a group of thermals over time in zero wind conditions on astoundingly flat ground with astonishingly little variation in heating.



However, if you add a small degree of variation of local heating and a little wind, the result is increasingly chaotic.

Lake Keepit scientists, armed with thermometers and drawing pads have been to the Sahara and come back with some more astonishing results. First, we took the easy option and downloaded some 'hex' patterns found in nature off the internet, these bubbles shown above. Note that some are only five-sided hexagons, but that's the internet for you.

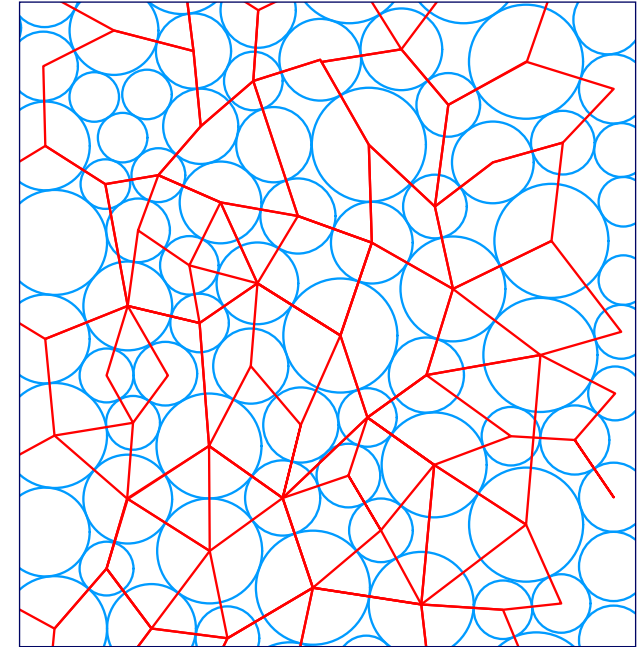
The shapes are not particularly regular either but perhaps the bubble blower didn't try hard enough. Anyway, at a quick glance, you can recognise patterns



of hexagons without much trying. (If you recognise patterns of pentagons, consult a specialist.)

Apart from bubbles and bees nests, you can find pictures of clouds in satellite photographs which are hexagonally spaced. Does this mean we should always track 60° on leaving a thermal? What about the clouds which form in the shape of a fish? Or the face of Jesus? Do they contain patterns of thermals?

The satellite photograph above shows a more representative sky where the distribution of thermals is based on the French model... that is to say, they are packed as closely together as the first, regular set. However the size of the thermals size varies and therefore the spacing varies too.

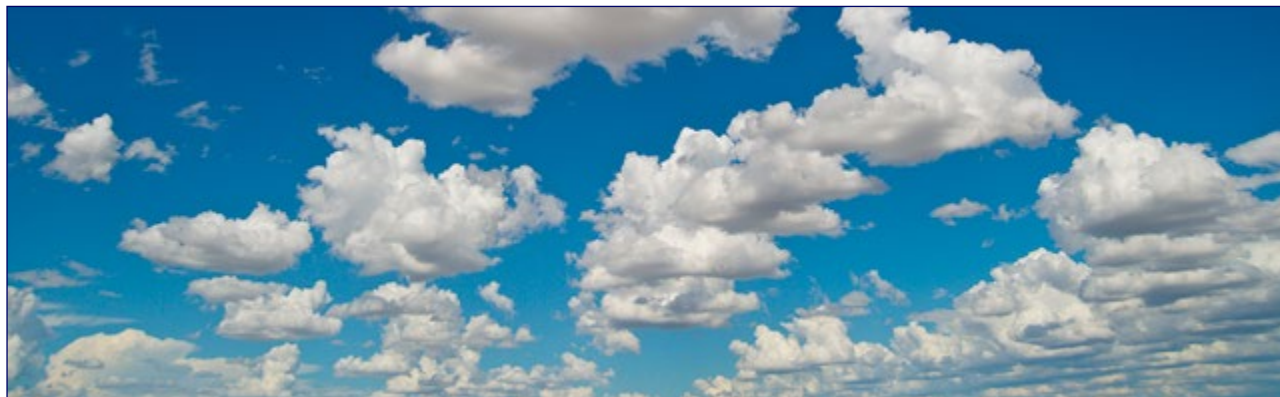


The resulting pattern is, to my eyes at least, random. Nay, chaotic.

We've all read Hans Killer's book with the lists of suitable thermal triggers, from piles of burning leaves and tractors and farmhouses and feedlots to the ploughman slowly plodding his weary way home and we believe all this in spite of finding that *none of these sources work most of the time*.

In other words, one of these triggers may work but at a rate so low that it's statistically chaotic.

But was the thermal we found really triggered by the claimed trigger? We found the thermal *near the farmhouse, near the tractor* or near some other magic feature.



Near a feature but perhaps far enough away to be from a random source.

On a windy day, these sources and triggers all align so that we can get cloud streets. The rocky outcrops, the dark paddocks, the tractors and the ploughmen obligingly line up to help this happen. Either that, or at some relatively low and chaotic level in the atmosphere, the cores all shift into line. I have flown cloud streets but I have not flown through a chaotically turbulent layer closer to the ground where the random physical triggers at ground level stopped and regularly aligned cores began.

So perhaps the answer dear reader is, it's all in your mind. There are no patterns. It's all random. Here's Dawkins (VMFG) again: "*With respect to these effects, it is theoretically possible for us to recalibrate ourselves, learn to adjust our flying to a level more appropriate to our experience (that's to say, to accept the chaotic nature of the air)*".

*"But this seems to be revealingly difficult even for sophisticated scientists and mathematicians. The fact that we still read so many books and attend so many talks, all suggests that we do not, on the whole, learn to recalibrate ourselves. It suggests that the parts of our brains responsible cross-country flight are still back in the stone age!"*

As Charles Dickens said (Southern Cross) "*Approach a cross-country flight expecting random thermal behaviour, result happiness. Approach a cross-country flight expecting a regular pattern of behaviour, result misery.*"

And Richard Dawkins "*Traditional thermal soaring is about turning untested belief into unshakable truth through the power of institutions such as Basic Gliding Knowledge and the passage of time.*"

But it's important to have rules (normally in groups of 10). Gliding would not be flying without rules. So here are some.

## 10 Golden Rules for Thermal Flight (after Mao)

**Rule 1:** It's all random. (That is to say, there's no rule 1).

**Rule 2:** If in doubt, follow the lift up ahead... until it's time to turn onto base.

**Rule 3.** To read too many books is harmful.

**Rule 4.** Be still my beating heart! Chill out and feel the air.

**Rule 5.** There may be no pattern, but there are thermals.

**Rule 6.** Fly with a velvet glove. And then fly with an iron fist.

**Rule 7.** Learn to love sink (but not for too long).

**Rule 8.** The glider must move amongst the clouds as a fish swims in the sea.

**Rule 9.** A frog at the bottom of a well thinks the sky is only as big as the top of the well. If he surfaced, he would have an entirely different view. Don't fly so close to clouds that you cannot see them.

**Rule 10.** Lift the seat. Women hold up half the sky.

Postscript. *Yes, we got around the 750. Keepit, Lightning Ridge, Collie, Keepit. Jenny flew 860 and me, just over 800 because I got scared. David Holmes in the Duo turned earlier than us on this leg and flew 726. And Little Petunia? I'll let him give you his excuses.*

# MAINTENANCE MATTERS



Once again, a dedicated bunch of maintenance men and women spent a week in August fettling gliders, and the prison yard rang to the happy sound of rock breaking, mailbag sewing and warder bashing.

There was a Sunday Session chaired by Dennis Stacey in his GFA role bringing us inspectors up to date with current best practice as required by the CAA. There were few people who didn't leave without a nosebleed or headache of some type. It seems we are going to have to be a lot more diligent with many aspects of maintenance, not so much the hands on side of things but with the paperwork.

We must be a lot more careful with checking the status of ADs and ANs and documenting the results in

the glider's log book. It was serious stuff. The log book 'must be filled in correctly. Refer to the guidelines below AND DO IT PROPERLY. It will be a poor reflection on you in the coroner's court!' The word 'coroners' is used twice in the guidelines for doing a form 2 sent out by the GFA.

If you read the log books of many gliders, you will realise that there's considerable room for improvement in record keeping so personally, I have no argument against this move. One difficulty we found in following this up was the fact that many of the required documents are very difficult to find. EASA, the GFA and the manufacturer's websites have to be checked and the internet speeds prevailing that week, it made the process even more painful.



One manufacturer's website required an account and glider serial number before you could download ADs. Of course the account took a work day to ratify... 12 hours delay. I wonder what will happen to the next person who uses this same serial number to gain an account!

Paperwork might take as long to organise as the hands-on maintenance and perhaps splitting this into two... those who are good with spanners and grease and those who are good at finding paperwork, might be the answer to getting more gliders serviced in the allotted time.



I don't suppose that there are many members who have not experienced some part of maintenance week at one time or another but I think all would agree that there's little which warms the cockles of a maintenance man's heart more than to find a real defect. Maybe something for which an stern AD has already been issued.

Like parking meter inspectors, we love to scribble out a minor defect in a maintenance release or better still, that dream within a dream, to ground a glider with a major defect. Yes, I know there's one better, to ground an entire type but I don't intend to work on aluminium gliders any more and may miss out on this joy.

The picture alongside is one I took of M. Henri Farman at the Rheims 'Grande Semaine d'Aviation de Champagne' in 1909, a very good year for aviation. And a very bad year for maintenance inspectors. *Look at his aileron connection for heaven's sake!*

And where are the rudder pedals? Like Garry's undercarriage, the rudder controls have been fixed in place! Grounded!

For the 2016 edition of the LKSC Maintenance Week, I got the job of looking after ZAB, the Duo Discus, with our newish member, Paul Holten who has a great future in glider maintenance. The folding prop on Duos has been a long standing problem with hub cracks, dating back to 2006.

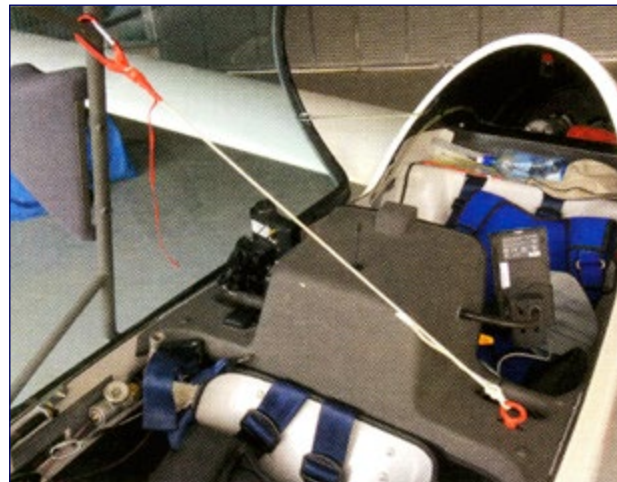


ZAB's prop had already been returned to the manufacturer before it came up to Keepit and there was an assumption that any hub problem was fixed but we found a good-sized crack in ZAB's prop hub, exactly where it was meant to be. And large enough that you might have expected that it would have shown up in the DI... but perhaps not.

A UK based Duo recently had the same problem but it was discovered in flight. While the sustainer was running, there was a loud bang and the engine started vibrating badly. The pilot also thought that there was some restriction in the aileron movement and decided to outland. It was discovered that the hub had failed in several places and two blades had flown off, one sticking into the wing root of the glider.



We found another problem with ZAB when putting the canopy back on the glider and this was the one which got us our dreamed-of grounding. Big canopies on two seaters put an enormous load on small hinges and when the canopy is restrained by a single wire at the back, the load can be concentrated on the front hinge. While inspecting for cracks at the hinges, we found the front one was wobbly to the point of being about to fall off. *Major defect! Grounded!*

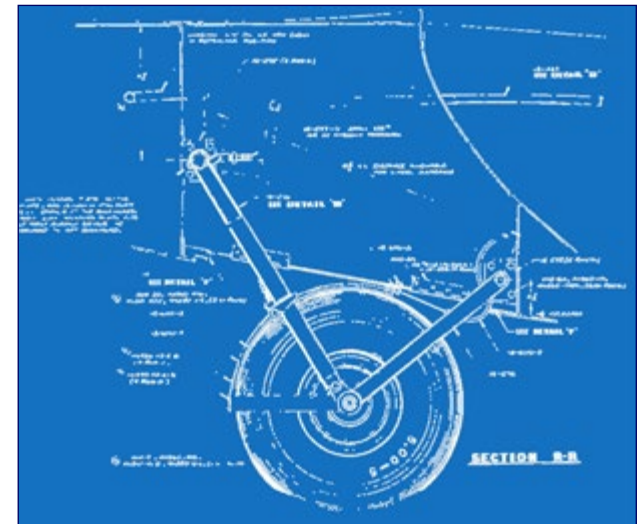


There was a suggestion in a recent S&G that Duo and Arcus owners should use a restraint in the centre of the canopy, attached to the frame between the two pilots and that this is a better solution than a single one at the back. This solution does require discipline to remove the restraint before takeoff so the canopy can be jettisoned if necessary..

Hopefully these defects are now fixed and the glider back in the air.

## SELF-FOLDING UNDERCARRIAGES.

There's long been a suspicion in the maintenance trade that the German designers could draw a nice sailplane but seemed to lose interest when it came to the landing part with the result that a lot of undercarriages self-retract while the glider is using them.



There was an interesting article in the same issue of S&G (April/May 2016) which suggests that the problem with undercarriages does not begin when the glider is landing or taking off, but while the glider is travelling in its trailer. What this article proposes is that the German designers did not have any lack of skill in designing undercarriages to take landing loads, but the loads imposed while the glider is in a trailer.

Think about it. The undercarriage on a single seater weighs a bit but on many two seaters, it's almost 60%

of the weight of the glider (or it certainly feels like it.) When the glider is in a trailer, bouncing along on some country road, all the weight of the wheel hangs off the retract mechanism and it was not designed to do that.

The suggestion is that when the glider is on its dolly, being loaded into the trailer, the undercarriage is lowered to rest on the floor of the trailer and somehow secured in this position so it cannot bounce up and down while the trailer is moving.

This sounds like an excellent idea, especially with heavy two seaters... if you can only work out a way of lowering the undercarriage and securing it while the glider is inside the trailer.

It's a nice grown-up feeling to be flying a certified glider compared with a low-rent, Johnny-come-lately uncertified aircraft made who-knows-where by someone and his cousin. However certification comes with its own problems, many of which seem designed to drive a maintenance man mad. My day job has something to do with designing machines which are made in similar quantities to gliders. They involve, as do gliders, a lot of fiddly nuts and bolts in hard to get to places.

The situation in Terrey Hills is probably different to that in say Poppenhausen over morning tea because if I have designed something which gives our guys a nosebleed when trying to assemble the part because of the placement of some bolt or other, they will let

me know very soon and the parts will be changed, sometimes several times until assembly and disassembly is as easy as possible.

If we are sure the part or assembly will have a life span of many years (in our case tens of thousands of hours of work) we may be less careful about ease of assembly but otherwise, ease of assembly and maintenance are top of mind when designing.

This can be a vexing process, involving not only redrawing assemblies but changing programs on CNC machines and re-running the new parts.

Furthermore, if over time we find that some part is not giving the life or performance expected, or some new part is discovered which does the same job better in some way, we'll normally fit it, in a process of continuous improvement. This does not appear to happen with certified gliders.

Most glider owners and agents seem to hold the factories in awe and reverence and never ever try to ruffle feathers by complaining, however lightly, about maintenance problems caused by sloppy design.

The single most time-consuming part of a Form 2 inspection on the Duo is removing the belly cable release. The reason for this is two-fold. One is that the seat pan is a stressed member and has the harness attachments bonded onto it.

It is restrained by something like 139 fairly soft cross-headed screws which have to be removed before

the seat pan can come out. (Cross headed screws on modern machinery? Gasp!)

Have they not heard of hex-headed button head cap screws which can take a ball-end Allen key well off the vertical!) (And Bunnings grocery store cheese screws too which burr over as soon as a screwdriver slips on them!) See below...

The other problem is that the belly Tost release is fixed to the fuselage and a bulkhead by brackets either side secured by 8 nuts. Two of these nuts are so close to another fastener that they can only be turned 1/8th of a turn before the spanner has to come off and turn the other pair by a similar amount and so weiter.

Moving one pair of bolts as little 10mm would fix this situation and mean an hour or two less work to remove and the same to replace. It's a situation which persists across many models... the Arcus appears to be identical in this respect. My guess is that this state of affairs must have something to do with tea rooms and the lack of healthy banter between the designer and the workers.

Would moving the bolts really require re-certification or is it just that they don't want to carry two sets of brackets? How about making additional holes in the new brackets, so the new versions fit the new and old bolt positions? Solved! My invoice is in the post.

# THE OBSERVERS BOOK OF SCREWS

I was having a casual chat with my wife in bed one Saturday morning about what constitutes a good screw and found to my horror that in spite of having worked (albeit reluctantly) in engineering for 20 years, that she did not know the difference between a Phillips head and Pozidrive head screw and why we try to use neither in the machines we make.

There are dozens of different shaped sockets on screw heads and each is designed to suit a different purpose and each requires the right size and profile of screwdriver to avoid problems and damage.

Cross headed screws appeared about a hundred years ago in production line manufacturing. The Phillips head screw was invented to solve the problem of screw heads being twisted off when they were inserted with power tools. The idea was that the screwdriver bit twisted or torqued out of the screw.

Yes, in most cases this mashed up the screw head and rendered it unremovable but at least it did not shear off. Later on, torque limiting devices were developed for power screwdrivers and today, almost every power driver and battery drill has a torque limiter on it, so the last thing you want is for the screwdriver bit to torque out of the screw head and wreck it.

The Pozidrive and Supadrive screws were developed for use with torque limiters to stop the screwdriver twisting out of the screw head. These types are almost universal in Europe while Phillips is more common in the USA.


















If you use the wrong screwdriver, you run the risk of damaging the screw and possibly rendering unremovable by normal means. The Japanese tend to use their own JIS screw heads which like the common Pozidrive and Supadrive screw heads are not compatible with a Phillips head screwdriver.

It is especially important to avoid damaging screws in gliders where they need to be removed and replaced often. The most common place where you'll find these screws is in the cockpit, holding down panels and seat pans which need removing at each annual inspection to inspect control runs and releases.

It's important to use the right screwdriver on instrument panels where black painted nonferrous screws are used which look nasty when damaged. It's important not to drop these too because they can be a devil to retrieve without the use of a magnet.

You might think that cross head screws had no place in a glider and you'd probably be right. Standard hex head screws have none of the disadvantages of cross head screws. There's only one style of hex socket (it's hexagonal!). It's almost unknown to find a Bunnings style artificial metal hex socket head screw. Ball ended hex screwdrivers can apply plenty of torque at difficult angles.

Honestly, I'm buggered if I can think of a reason to use a cross head screw instead of a hex head, especially in a glider!

Traditional Phillips	
Recessed Phillips	
Phillips	
Reed & Prince or Frearson	
JIS (Japan)	
Sel-o-fit	
French Recessed	
Pozidrive	
Supadrive	
ACR Phillips	
Phillips square drive	
ACR Phillips square drive	
Phillips square drive II	
Phillips II	
Quadrex	
Recex	
Mortorq	

# THE LOW- DOWN ON LOW TOWS



In Australia, we use the low tow position when aerotowing and we're told that this is used because it's safer than the high tow position and reduces the possibility of tug upsets. But according to Allan Ash, that's not the reason it started at all.

Shortly after the second world war, glider pilots were hard put to find anything decent to fly. Most clubs had one or two primary gliders and if they were lucky, a high performance glider capable of soaring such as a Grunau Baby. The majority of training was done in single-seater primary gliders.

The TG-3A was a two seater training glider manufactured for the U.S. Army Air Forces by the Schweizer to train pilots for larger cargo and personnel carrying gliders. The TG-3A had, for the time, a conventional construction of wood and fabric wings and a steel tube fabric covered fuselage and a

blistering performance of 20:1. Even for the time, the glider was heavy.

When the war finished there were dozens of TG-3s sold as surplus and the Sydney glider clubs managed to import one. The normal methods of launching at the time were car tow and winching with some aero towing and bungee launching. The Hinkler club had the use of a Tiger Moth.

"At Camden, we discussed the poor performance of the Tiger Moth as a tug. Clearly it lacked the power to pull such a large and heavy sailplane (as the Schweizer TG3) but we had no other tug so had to come up with a solution. After another tow, in which the GG3 got off a little faster but still needed too much runway, Fred Hoinville commented that he couldn't keep the Tiger's nose up because the sailplane kept lifting its tail.

"Kevin Maloney was asked to fly lower until he was sitting in the Tiger Moth's slipstream. This gave a better launch but it was not enough. Fred said, 'Try flying below the slipstream. That should help it to climb.' Somebody said, 'It might pull the tail down.' Fred replied, 'Isn't that the best way to get the nose up?'

"So we tried it and it worked well. With the sailplane in the usual position above the slipstream, the Tiger Moth could barely manage a climb rate of 100 feet a minute. With the sailplane below the slipstream, the rate of climb was better than 300 feet a minute. With further practice, even this figure was improved.

Having demonstrated the efficiency of towing the TG3 this way, we tried it with the Grunau Baby and that it improved the rate of climb of the two aircraft and the stability of the combination."

## TUG UPSETS

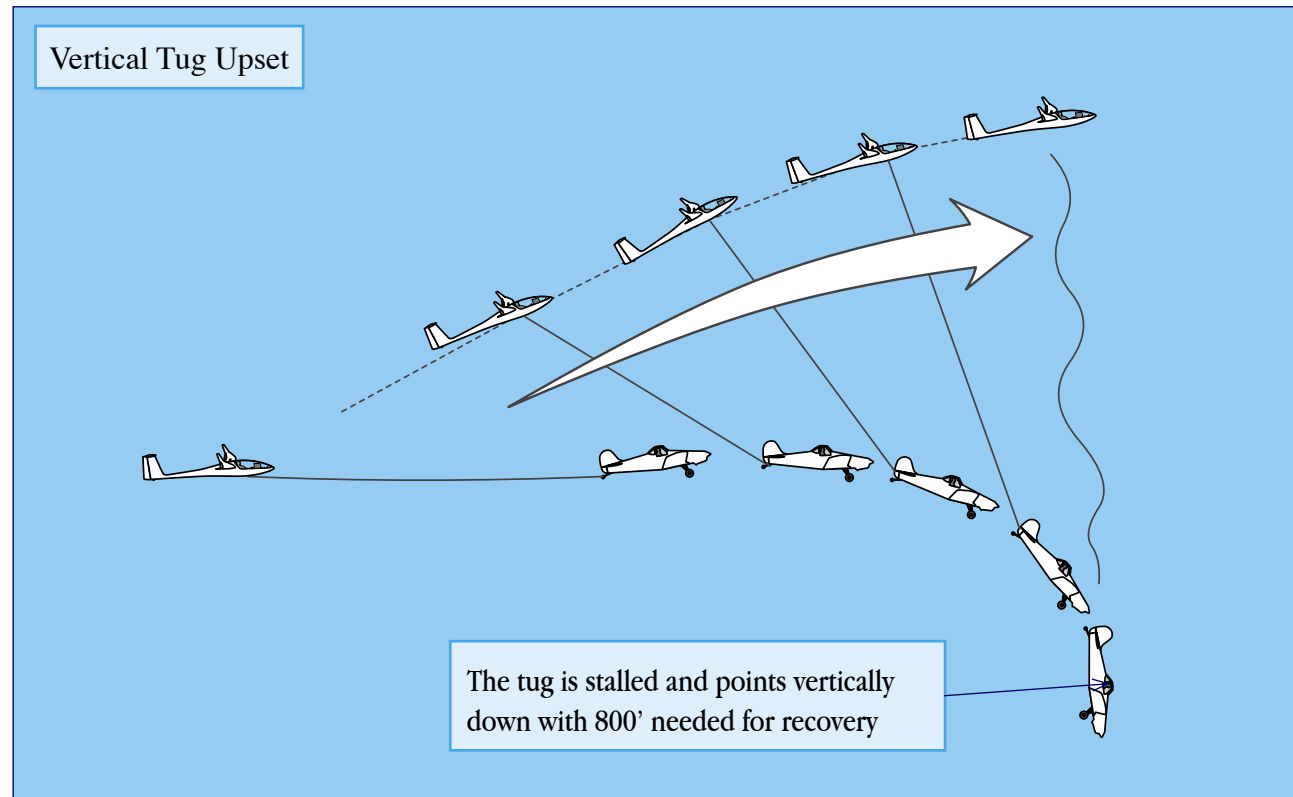
A while ago, Miss Val asked me to mention tug upsets. In fact she had a short quiz during briefing about this topic and more than a few of us got a stern “see me afterwards”.

A tug upset happens when the glider on tow gets far enough out of position that the tug pilot no longer has control over the tug. Tug upsets are largely caused by the glider pilot and can be fatal for the tug pilot, so it's essential to understand how they occur and what to do if an upset looks likely.

In a tug upset, the glider on tow gets too high, pulling the tail of the tug upwards. This type of tug upset may happen very rapidly... in perhaps 2-3 seconds. The glider zooms rapidly upwards at a high angle of attack, more like winching than aerotowing. A vertical tug upset can even happen before the tug is airborne if the glider climbs too rapidly.

The tug rapidly slows and pitches nose down in a deep stall. At this point either the weak link breaks or one of the aircraft releases. If the upset happens at low altitude the tug may not have enough height to recover, even from as high as 800' and the result is often fatal.

It's important to realise how quickly this type of upset can happen and if the tug disappears from your view, you must release immediately.



When aerotowing, always make sure that you are paying complete attention to the position of the glider in relation to the tug when on tow and if you cannot maintain position, release.

There are several factors which increase the chance of getting into a situation where a tug upset is likely to happen.

- Aerotowing using a belly or CofG tow hook.
- The glider has high-mounted wings.

- The glider is lightweight or has a low wing loading as with some training and older gliders.
- The glider pilot has low hours on aerotow.
- Lightweight pilots.
- Short tow ropes.
- Gusty or very thermic conditions.

Obviously, a combination of these factors, such as a lightweight glider, with a lightweight low-hours pilot on a short tow rope increases the odds of an upset.

# Lake Keepit Soaring Club

## Sanitary Services Division

### Standard Operating Procedures

#### Pilots, male for the use of

##### Mission statement:

To provide a professional, vibrant and effective ablution environment to members of all genders, species and guests of LKSC.

##### Goal:

To ensure that LKSC is a world leader when it comes to all forms of activities on site including gliding, soaring, aerotow and winch launching, social and toilet activities.

##### Objectives:

See above.

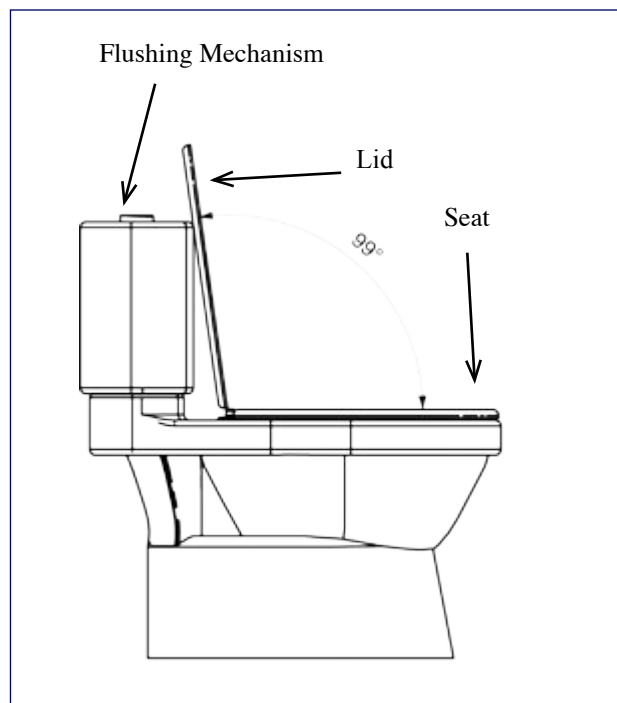
##### Definitions.

The words toilet, lavatory, WC, loo, dunny are common euphemisms for interior spaces and Equipment used for human excretion actions including but not exclusively; Action 1, Action 2, and Action 4, liquid and solid. In the SOP, the word toilet will be used to denote the Equipment as a totality.

Action 4 is the occasional process of cleaning the Equipment.

A toilet seat is a hinged two-part unit consisting of a **seat** and usually a **cover or lid**, which is fastened to the bowl by a hinged fitment so the unit can be used in a sitting position as well as a standing position.

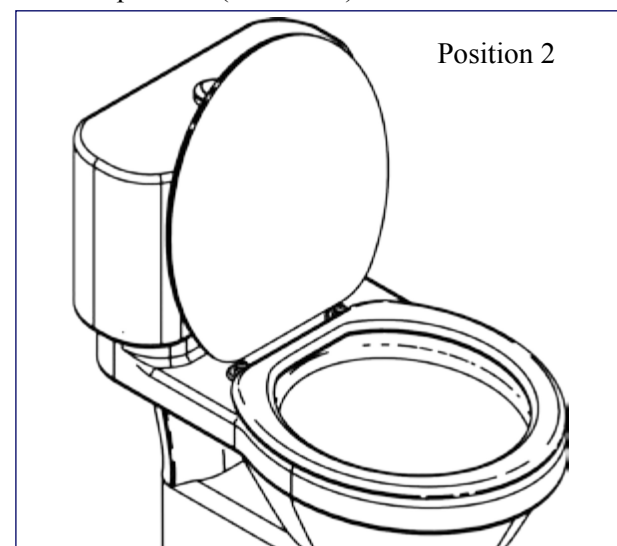
A toilet seat consists of the seat itself, an ovoid ring which may be contoured for the user to sit on, and the lid, which may cover the toilet when not in use the lid may be absent in some cases, particularly in public areas. When the lid is down, the lid may be used as a seat.



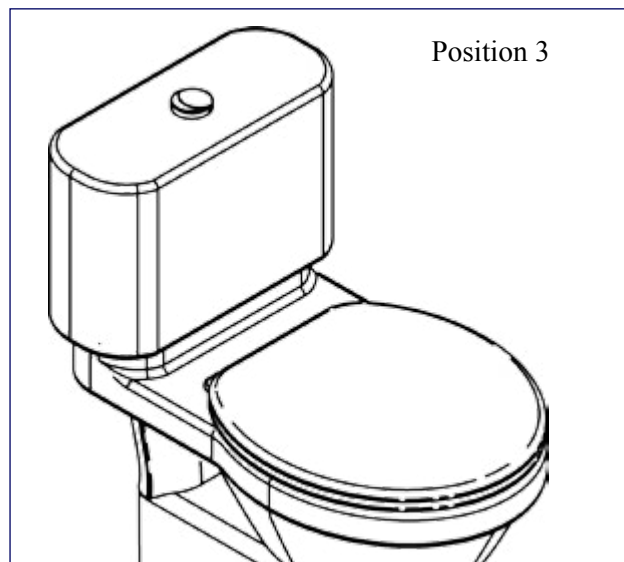
Therefore there are three possible positions: **Position 1.** Both seat and lid in the raised or vertical position.



**Position 2.** Lid raised vertically and seat in the lowered position (see below).



**Position 3.** Both lid and seat in the lowered position.



**Note:** in badly designed Equipment installations, Position 1 may not be possible without a physical prop such as the user's leg due to the seat or lid angle being less than 90°.

### Standard Operating Positions (SOP)

**Position 1** is generally used when a man stands

to urinate (Action 1), or while cleaning. (Action 3).

**Position 2** is generally used when a woman sits to urinate (Action 1) or all genders defaecate (Action 2).

**Position 3** is not used for Action 1 or Action 2 but is the generally advised position at other times such as on departure or to prevent animals drinking of climbing in or objects falling into the bowl.

At night, in the dark, men commonly mistake Position 3 for Position 1 however the noise and spray wetting their lower legs normally alerts them to their mistake.

A Sitzpinkler is a man who sits for Action 1.

### Advisory note:

**Sitzenpinklers.** In some regions, there is considerable pressure for this to be the normal operating procedure for Action 1 though the word Sitzpinkler is often used as a term of abuse. Sitzpinklers are advised to not mistake Position 3 for Position 2 or Position 1.

**Frequency of Actions.** Action 1 and Action 2 are performed as required. Action 3 should be performed at the annual inspection or whenever 200 Action 1 or 100 Action 2 have occurred.

**Note:** For RPT aircraft fitted with toilets, the frequency of Action 3 may be increased by a factor

of 100. This may extend to beyond the annual inspection due to the fact that few passengers perform either Action 1 or Action 2 in flight unless absolutely necessary making the Equipment essentially self cleaning.

**Note:** For Action 4 (vomiting) Position 1 or Position 2 may be used. Position 3 may not be used. Advanced Action 4 may be done whilst kneeling (Optional Position 4). After Action 4, Action 3 is required.

### Operations.

While men will almost always use Position 1 when performing Action 1, and women will use Position 2, there's considerable variation in which the Equipment is left after departure.

### Position for Departure.

Women prefer on Position 2 or Position 3 as the Position for Departure while men use either Position 1 or which ever Position takes the least time.

Women may insist on men leaving the Equipment in Position 2 or Position 3 and penalties frequently apply, especially in low use environments.

Male users report difficulty understanding which Position for Departure is the optimum in mixed use

environments and the error rate is frequently 100%.

In order to encourage all gender usage of LKSC and its Equipment, it's essential that male users understand the importance of the correct Position for Departure. Training is recommended.

#### **Remarks:**

The desired Position for Departure of the Equipment is closely related to Germ Fear (see EASA bulletin 1682-0220R6. However EASA AN 2016-08471 overrides the former, noting that Germs are now good for you and Germ Fear is no longer an advised practice.

#### **Revisions:**

Based on the above, it is suggested that simply moving the Equipment from Position 1 or Position 3 has health benefits for women.

#### **Ref. Publications:**

**Note: The contents of this manual are uncontrolled if downloaded, printed or discussed in groups.**

### **Extract from A Game Theoretic Approach To The Toilet Seat Problem**

The issue of men leaving the seat up or putting it back down after use (particularly for the benefit of women), is a perennial topic of discussion and domestic drama; with it often being argued that leaving the toilet seat in Position 1 is more efficient for men, but putting it in Position 2 is more considerate of women.

If present the lid is frequently left in Position 3, but it can be closed to prevent small items from falling in, or to reduce the spread of germs and odours when the water is aerosolized on flushing (see Germ Fear above). The lid is usually placed in Position 3 for aesthetic purposes or to provide a chair.

An individual must behave in an appropriate manner to find a place in a club environment. There are certain manners which are expected. One needs to be mature and sensible enough for others to respect him or her.

This paper analyses the issue of choosing a socially efficient rule on how to leave the toilet seat. Leaving the seat as it is after usage is found to be the best rule over a wide parameter space. Using a loss function minimization approach, factors such as relative toilet usage, frequency of Position 2, relative gender importance and cost elasticity to seat movements are considered.

**Leaving the seat as is after usage proves to be dominating a large set of other rules that entail no**

**strategic interaction.**

In this paper we consider a simplified model of the toilet seat problem. We shall show that for this model there is an inherent conflict of interest which can be resolved by a equity solution.

Consider a room with one omnipurpose toilet which is used for two toilet actions designated as Action 1 and Action 2. Note: Actions 3 and 4 are ignored for the purposes of this exercise. The toilet has attachments which we shall refer to as the seat and lid (but see remark 1 below) which may be in either of two positions designated as Position 1 and Position 2.

Toilet operations are performed by members of the human species (see remark 2 below) who fall mainly into two categories, popularly designated as male and female (see also Sitzpinkler). For convenience we shall use the name John to refer to the typical male and Marsha to refer to the typical female.

The performance of toilet actions by John and Marsha differ in a number of respects. The costs of these operations are peculiar to their respective genders and are normally fixed except with respect to the position of the toilet seat (see Sitzpinkler).

In particular: Marsha performs toilet operations Action 1 and Action 2 with the seat in Position 2. John performs toilet operation Action 1 with the seat in Position 1 and Action 2 with the seat in Position 2. If the seat is in the wrong position before performing the toilet operation the



position must be changed at an average cost C.

Optionally the position may be changed after performing the toilet operation, also at an average cost C. (Changing the position of the seat during the performance of a toilet operation is beyond the scope of this note and is definitely not recommended.) Changing the seat position may also involve Germ Fear which is also not considered, as policy regarding Germ Fear is currently under revision.

Consider the scenario where John and Marsha each use a separate toilet. It should be obvious that each minimizes the seat position transfer cost by not altering the seat position after performing a toilet operation.

For Marsha the seat position transfer cost is 0 since all operations are performed with the seat in Position 2. For John the cost is greater than 0 since seat position transfers must be performed.

Let  $p$  be the probability that John will perform a Action 1 operation vs a Action 2 operation. Assume that John optimises his seat position transfer cost (see remark 3 below.) Then it is easy to determine that Johns average cost of seat position transfer per toilet operation is

$$B = 2p(1-p)C$$

where  $B$  is the single male cost of toilet seat position transfers per toilet operation.

Now let us consider the scenario where John and Marsha cohabit and both use the same toilet. In our analysis we shall assume that John and Marsha perform toilet operations with the same frequency (see remark 4

below) and that the order in which they perform them is random. They discover to their mutual displeasure that their cohabitation adversely alters the toilet seat position transfer cost function for each of them. What is more there is an inherent conflict of interest. Attempts to resolve the problem typically revolve around two strategies which we shall designate as J and M

#### **Strategy J**

Each person retains the default strategy that they used before cohabiting. This strategy is proposed by John with the argument Why does it matter if the seat is Position 1 or Position 2?. As we see below this strategy benefits John.

#### **Strategy M**

Each person leaves the seat in Position 2. This strategy is proposed by Marsha with the argument It ought to be in Position 2. As we see below this strategy benefits Marsha.

#### **Consequences of strategy J:**

Under strategy J the toilet seat is in the Position 1 with probability  $p/2$ . The respective average cost of toilet seat transfer operations for John and Marsha are:

$$\text{John: } p(3/2-p)C$$

$$\text{Marsha: } pC/2$$

**The incremental costs** (difference between pre and post habitation costs) **are:**

$$\text{John: } (p/2)pC$$

$$\text{Marsha: } pC/2$$

$$\text{Total: } (p^2)C$$

Johns incremental cost would actually be negative if  $p$  were less than  $1/2$ . This is not the case;  $p > 1/2$ . Note that Marshas incremental cost is greater than Johns for  $p < 1$ . Marsha objects.

#### **Consequences of strategy M:**

In strategy M the seat is always left down. When John performs operation Action 1 he lifts the seat before the operation and lowers it after the operation. The respective average cost of toilet seat transfer operations is:

$$\text{John: } 2pC$$

$$\text{Marsha: } 0$$

#### **The incremental costs are:**

$$\text{John: } 2(p^2)C$$

$$\text{Marsha: } 0$$

$$\text{Total: } 2(p^2)C$$

In these strategy Marsha bears no cost; all of the incremental costs are borne by John. John objects. Note also that the combined incremental cost of strategy M is greater than that of strategy J.

It is notable that John and Marsha each advocates a strategy that benefits them. This is predictable under game

theory. However the conflict over strategies has a cost M in inter-gender discord that is greater than the cumulative cost of toilet seat transfers. It behooves John and Marsha, therefore, to adopt a strategy that minimizes M.

This is not simple. A common reaction is to advance sundry arguments to justify adopting strategy M or J. All such arguments are suspect because they are self serving (and often accompanied with the If you cared about me ploy.) A sound strategy is one that is equitable and is seen to be equitable. In this regard there are three candidate criteria:

- (1) Minimize the joint total cost
- (2) Equalize the respective total costs
- (3) Equalize the respective incremental costs

The argument for (1) is that John and Marsha are now as one and it is the joint costs and benefits of the union that should be considered. This principle is not universally accepted. It is readily seen that (see remark 5) that the joint total cost is optimised by strategy J which has already been seen to be suspect.

Criterion (2) seems plausible. It requires, however, that Marsha put the seat in the Position 1 after performing a toilet operation some percentage of the time. No instance of this behaviour has ever been observed in recorded history; ergo this criterion can be ruled out. (But see remark 6.)

Criterion (3) argues that the mutual increased cost of toilet seat operations should be shared equitably, i.e., neither party should bear a disproportionate share of the costs of cohabitation. A short calculation reveals that criterion (3) can be achieved if John leaves the seat Position in 1 after performing toilet operation Action 1 with a frequency

$$f = (2p-1)/p$$

Since the value of p is seldom precisely measured and is variable in any event it suffices to use an approximate value of f. If we assume that  $p=2/3$  then  $f=1/2$ . This suggests the following convenient rule of thumb:

In the morning John leaves the seat in Position 1 after performing Action 1. In the evening he puts it down.

This rule may not be precise but it is simple and approximately equitable; moreover the use of a definite rule sets expectations. The seat is put down in the evening to avoid the notorious middle of the night surprise.

Its expected that this analysis should settle the toilet seat controversy for once and for all if John and Marsha are mathematicians.

**Remark 1:** The toilet has an additional attachment called the toilet seat lid which can only be down if the toilet seat is down (Position 3). When the lid is down the toilet is (or should be) non-functional for toilet operations. Some persons maintain the toilet seat lid in Position 3 when the toilet is not use.

For these persons the analysis in this note is moot. Such persons pay a fixed cost in seat movement for all toilet operations.

**Remark 2:** Toilets are also used by roos as a convenient source of drinking water unless the lid is down. (See remark 1)

**Remark 3:** Experimental evidence suggests that almost all single males optimise the seat transfer cost, the exception being those who put the seat in Position 1 after performing a Action 2 operation.

**Remark 4:** Folklore has it that Marsha performs more toilet operations than John, hypothetically because of a smaller bladder. John, however, drinks more beer. We shall not discuss his prostate problem.

**Remark 5:** Readily seen in this context means It looks obvious to me but I dont know how to prove it; you figure it out..

**Remark 6: The toilet lid solution is to put the toilet lid in Position 3 after all toilet operations.** This solution imposes a cost of 3C on each party and is accordingly more expensive. It is, however, more aesthetic. It also eliminates the “roo drinking” problem.