# Efficient Flying – XC Speed is Vertical Race

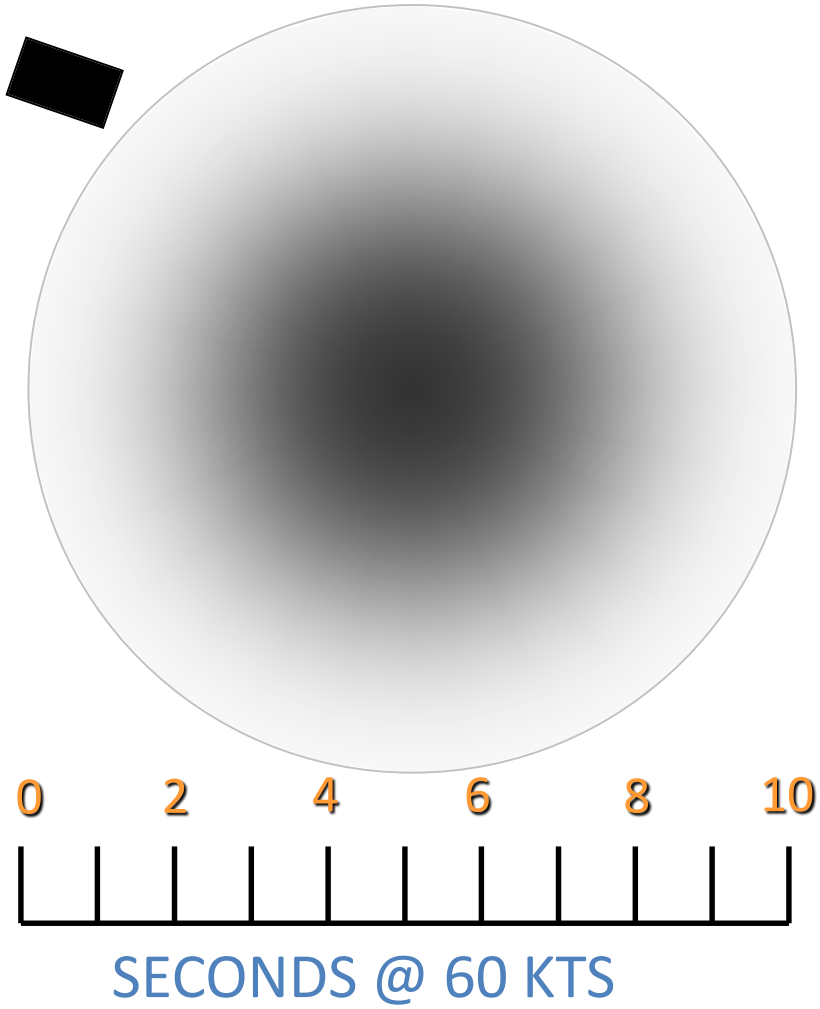
**XC Speed is More About the Vertical than the Horizontal**

- Out on course, most people cruise at about the same speed (roughly 80 kts on the East coast)
- Thus, XC speed is more dependent on quick climbs than on horizontal speed.
- This simple truth makes it very important to find the best thermals on a given day and use them for your climbs.
- Using weaker thermals will slow your cross country speed markedly – more later
- Finding the best thermals, centering them quickly and leaving them when you have enough altitude is a very important skill - practice this skill
- Accurate, responsive varios are also very important

# How to Approach a Thermal

A matter of scale – thermals are pretty big compared to your glider

At 60 kts (~100 fps) It will take about 10 seconds to traverse the average thermal.



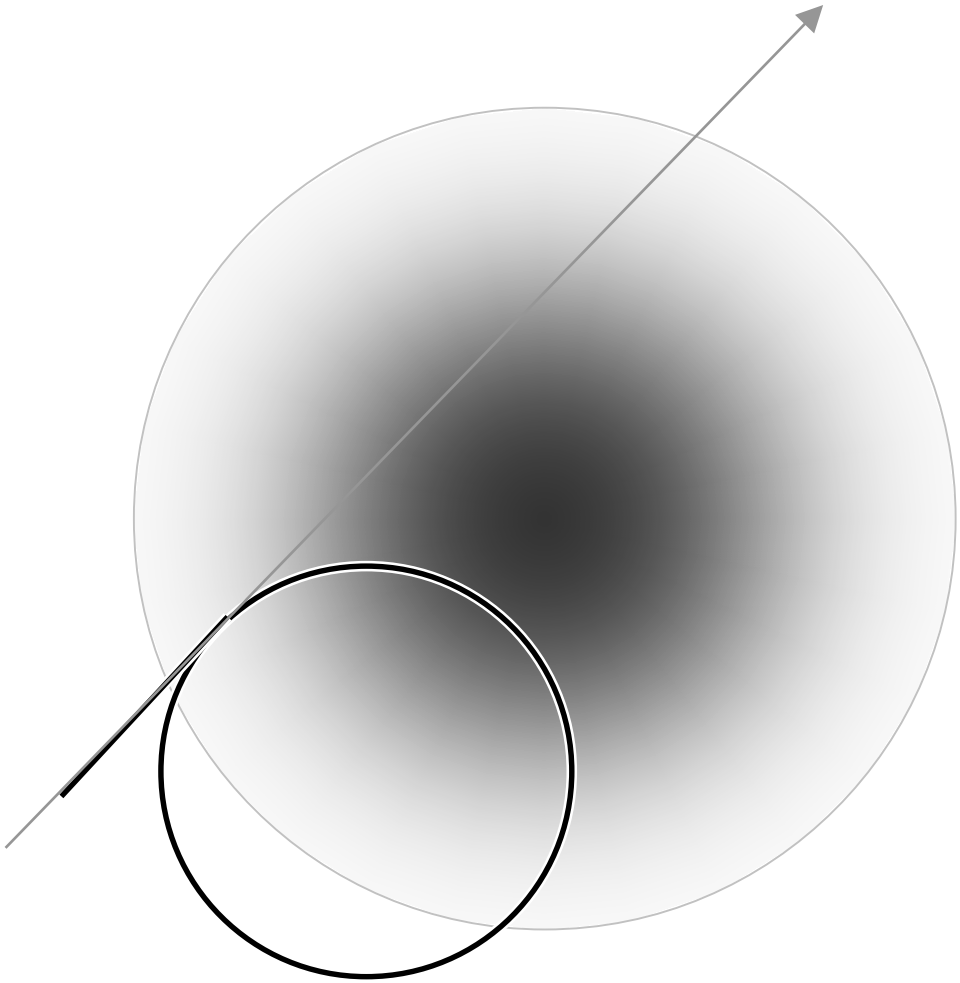

Don't blow into a thermal At 80-90 kts

Begin to slow down as you reach the edge of the thermal

Then you will have time to make good decisions about where to enter the thermal and the direction of your turn

Few experienced glider pilots are surprised by the vario indicating they are in lift they know it before the vario does – so develop a strategy to center quickly .

# Turning Too Soon



The vario was increasing when you turned

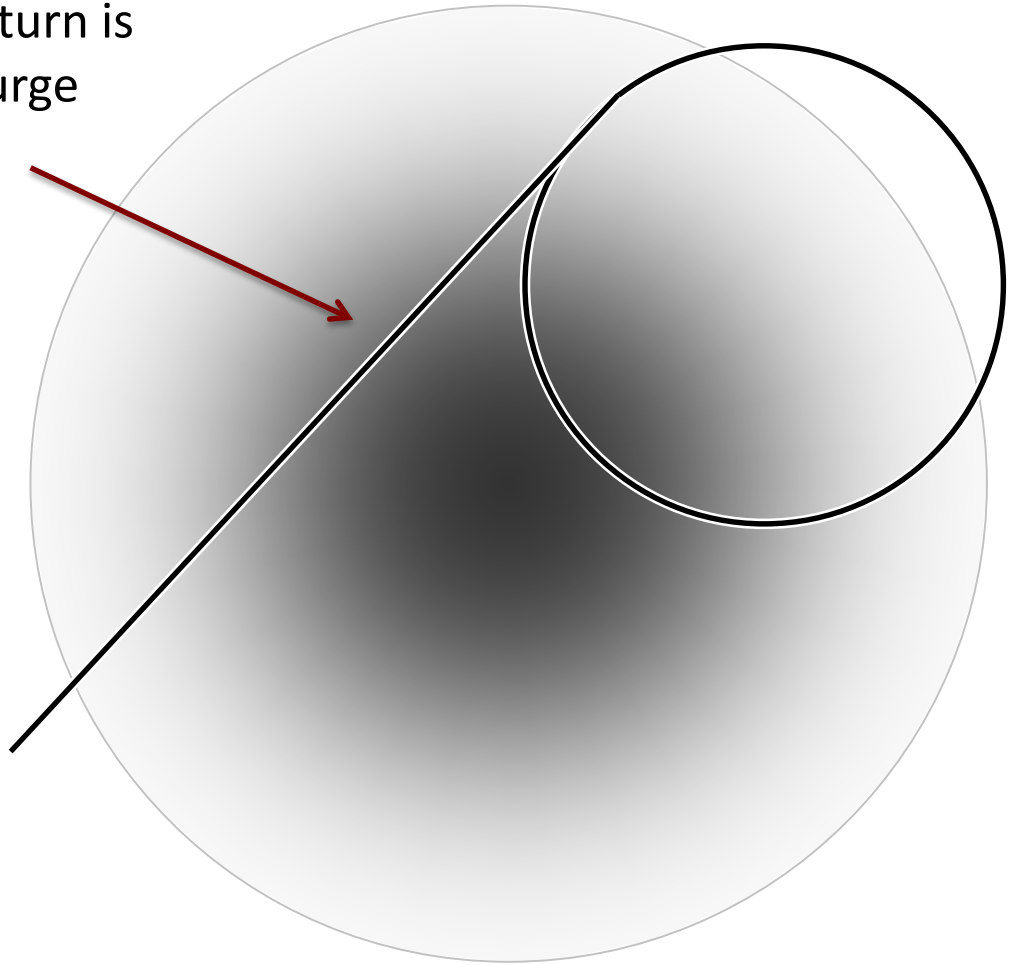
A common mistake driven by wishful thinking

Leads to starting the turn too soon.

Guarantees both that you fly in sink and that you spend too much time centering.

# Turning Too Late

The time to turn is on a good surge

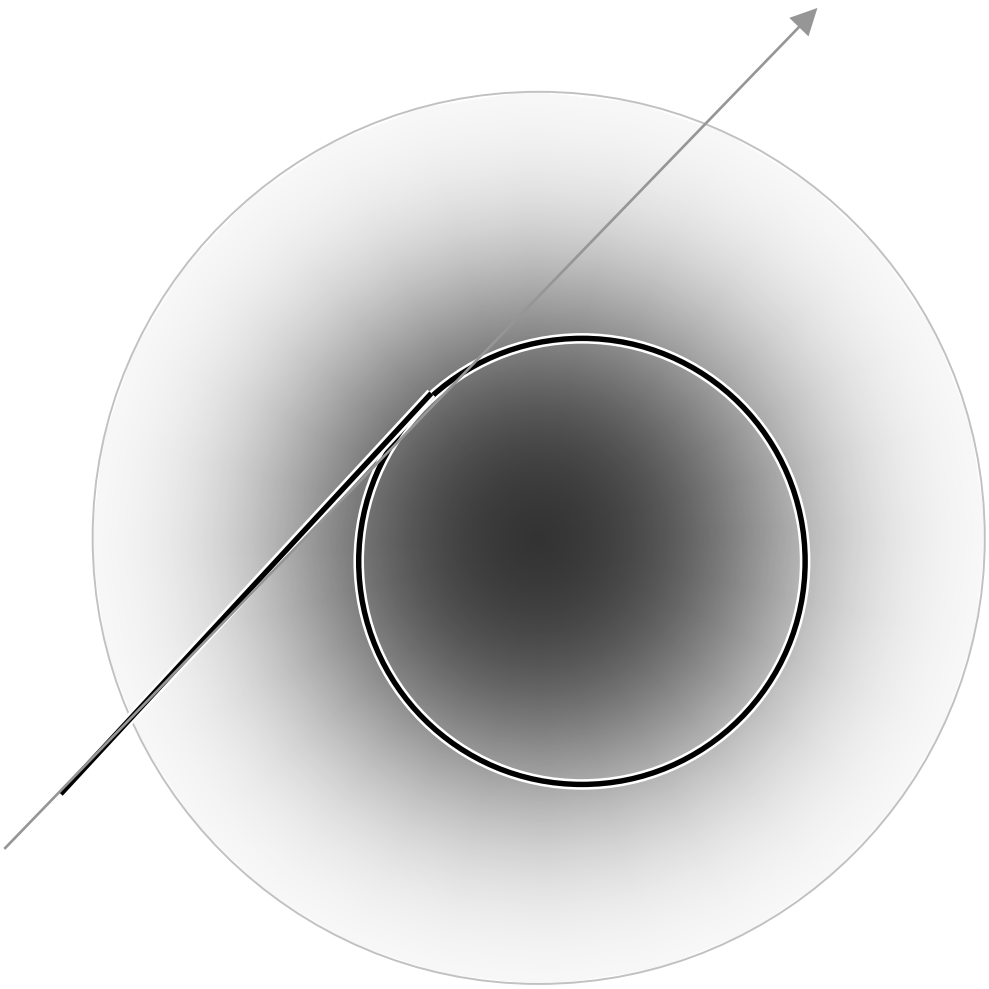


Turn as the vario reaches its maximum.

Don’t wait until It indicates sink

Bank with firm rudder and aileron – the thermal is trying to lift your wing

# Just Right



Whoa !!

How did that Happen ?

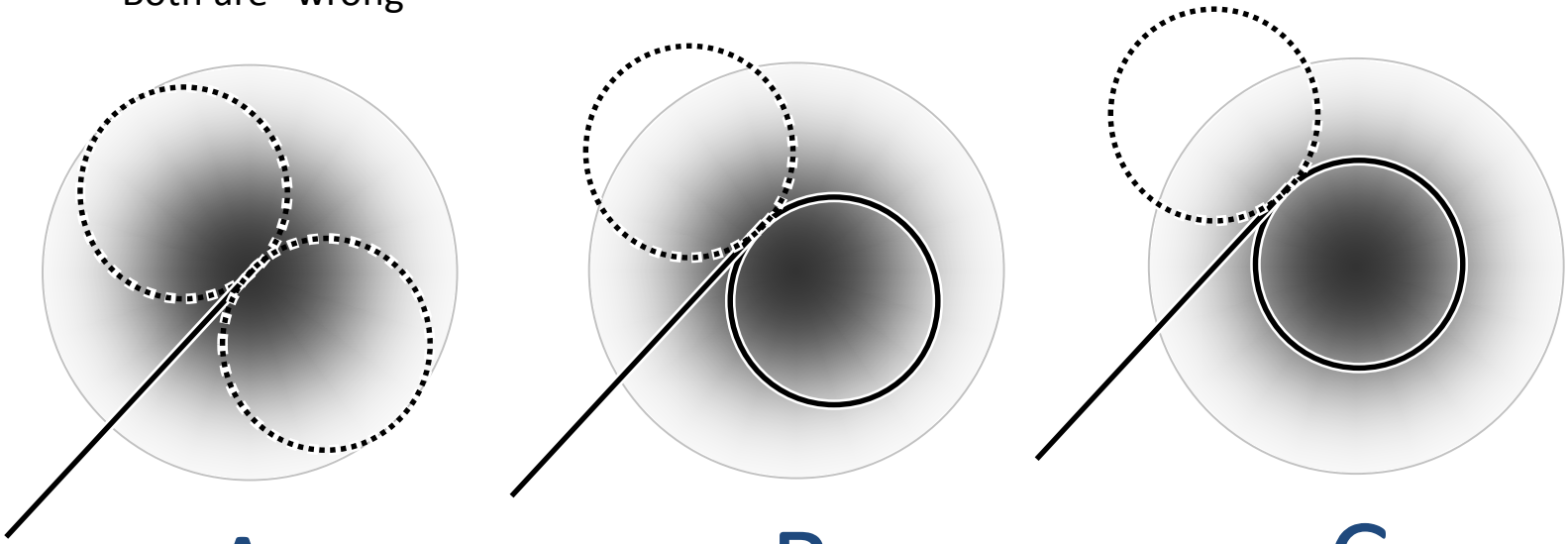
Practice to make this happen more than 30% of the time

# *Where* you Enter a Thermal is Important for Quick Centering

Turn Either Way
Effect is Same
Both are "wrong"

Right Wing Favored
Did it Lift to Tell You ?

Perfect Entry – maybe
30-50% of the Time



A

Enter On The Radius

B

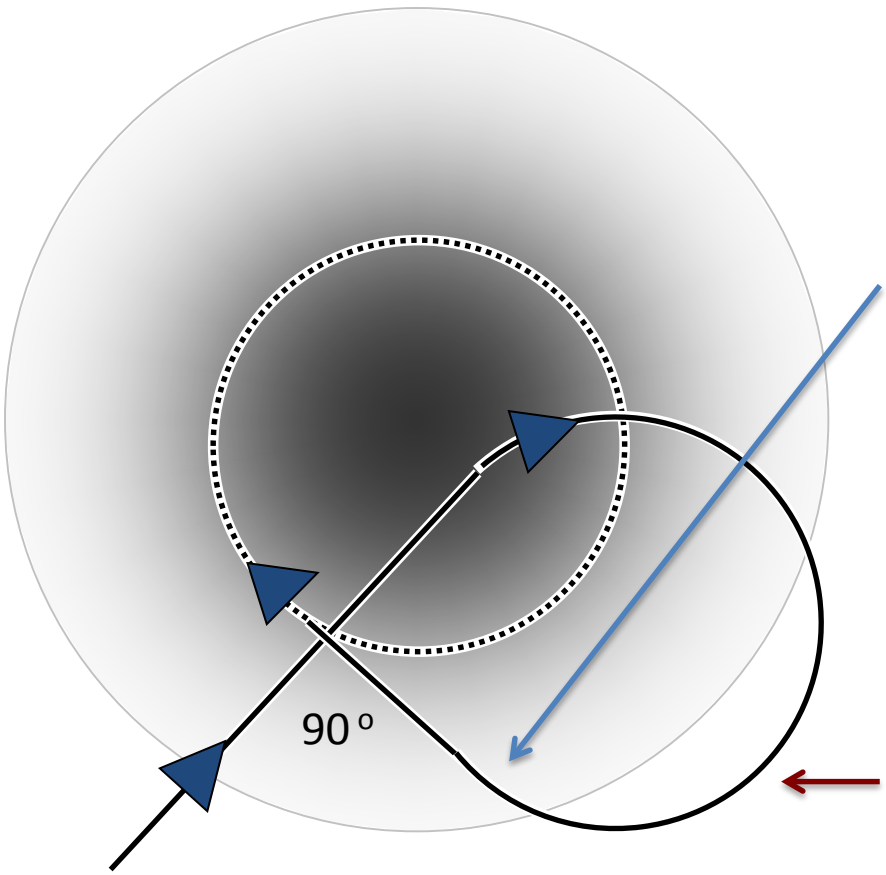
Enter To One Side

C

Enter More To One Side

The correct entry point is hard to know, but you can improve your chances by reading the cloud correctly and/or observing birds or other gliders

# The Standard 270º Correction




When the vario indicates sink soon after the turn begins…..

Roll level on a heading perpendicular to the entry course line –

Then roll back into the thermal as you cross the entry point

This method will work even if you do not go out of the thermal here

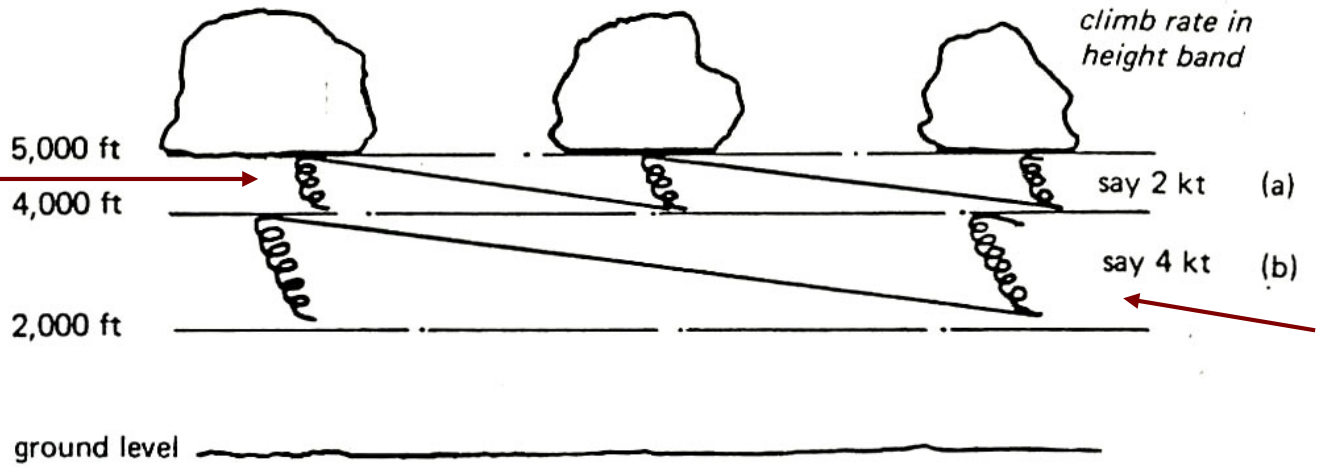
It works Most Every Time

# Using Lift Efficiently

How can you use a thermal day most efficiently ? The plan must incorporate using the best part of the lift band in each thermal and *only using the strongest thermals for extended climbs*. Using only the upper 1/2 of the lift band will greatly extend the time needed for the flight. Surprisingly, flying a bit too slow on course does not cause a great time penalty as long as you skip the weak thermals and only use the strong ones. However, flying too fast is more likely to *cause* a landout……

Consider the following idealized 300 Km flight in a glider of 30:1 L/D. The flight is conducted in the lift found in the diagram below. The mathematical results are found on the next pages.

This may be good for silver distance




May need for gold distance

*Figure 21. Using the best height band.* Realising that these alternatives are idealised, the local-soaring pilot will (a) aim to stay high and use the upper height band and every thermal, while the experienced cross-country pilot will (b) use the lower height band and the strongest lift as well as being able to select or reject the best thermals.

# The Cold Hard Facts

To glide 300 km in a 30:1 ship, you need to climb 10 km (~ 33,000 feet).
The simple calculation below shows the benefit of using the best lift.

| Flight Phase | Height Band Used: 4,000 - 5,000 ft (200 ft/min) | Height Band Used: 2,000 - 4,000 ft (400 ft/min) |
|---|---|---|
| Climbing | 33 thermals x 5 min at 200 ft/min = 165 min | 16.5 thermals x 5 min at 400 ft/min = 82.5 min |
| Centering | 4 turns of 30 sec = 33 x 2 = 66 min | 4 turns of 30 sec = 16.5 x 2 = 33 min |
| **Total Time** | **231 min = 3.85 hr** | **115.5 min = 1.93 hr** |

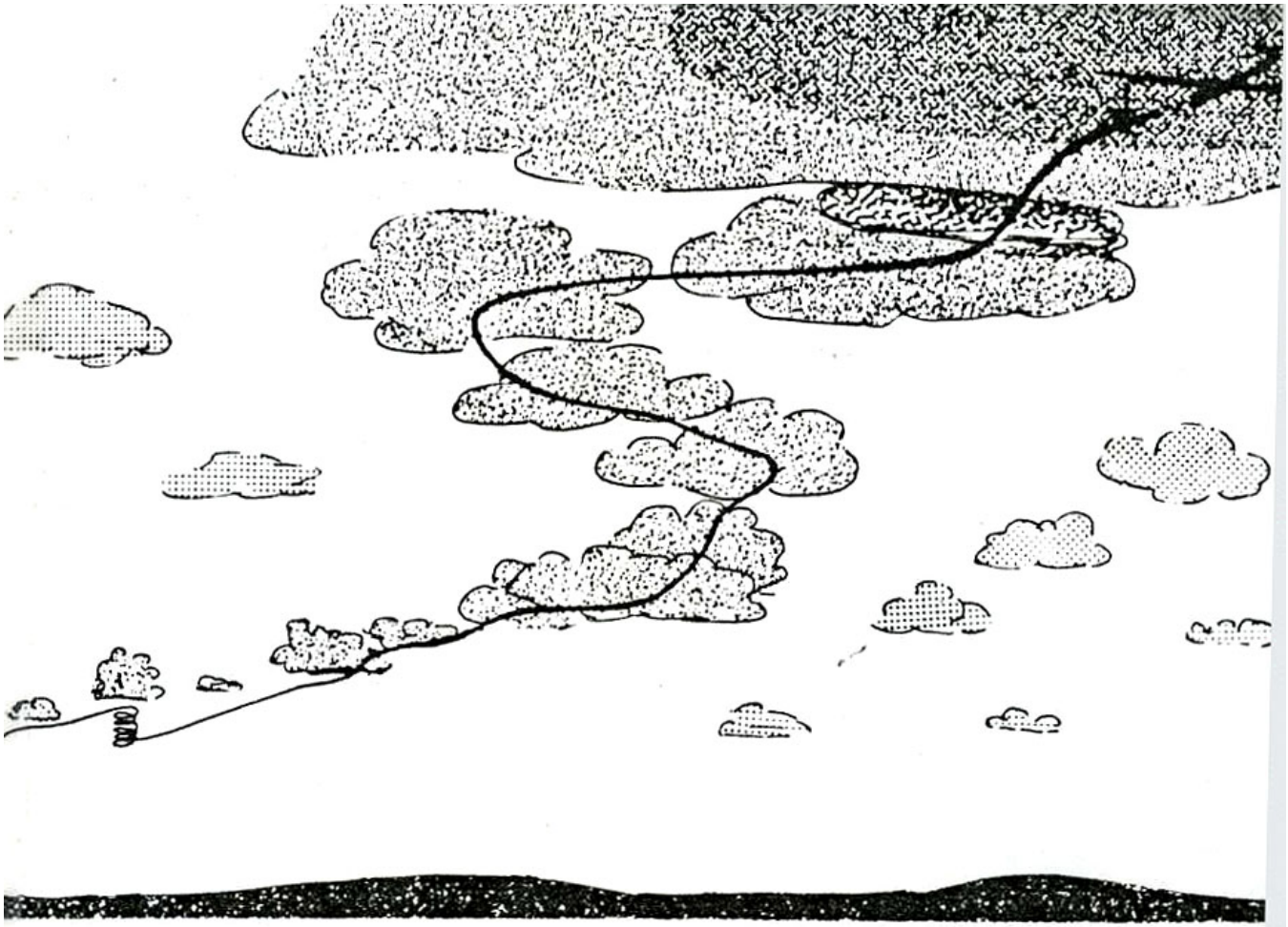
**This is Climbing Time Only - You have to glide too !**

Notes –

- Use of better lift cuts climbing time by ½ - obvious but easily forgotten
- Slow centering can waste hours during a long flight
- The combination of slow centering and weak lift slows the flight more

# Even Better – Don't Circle - Follow the Energy

Plan your flights to go from one thermal to another in areas of lift. Try for 25% of flight time on course in thermals



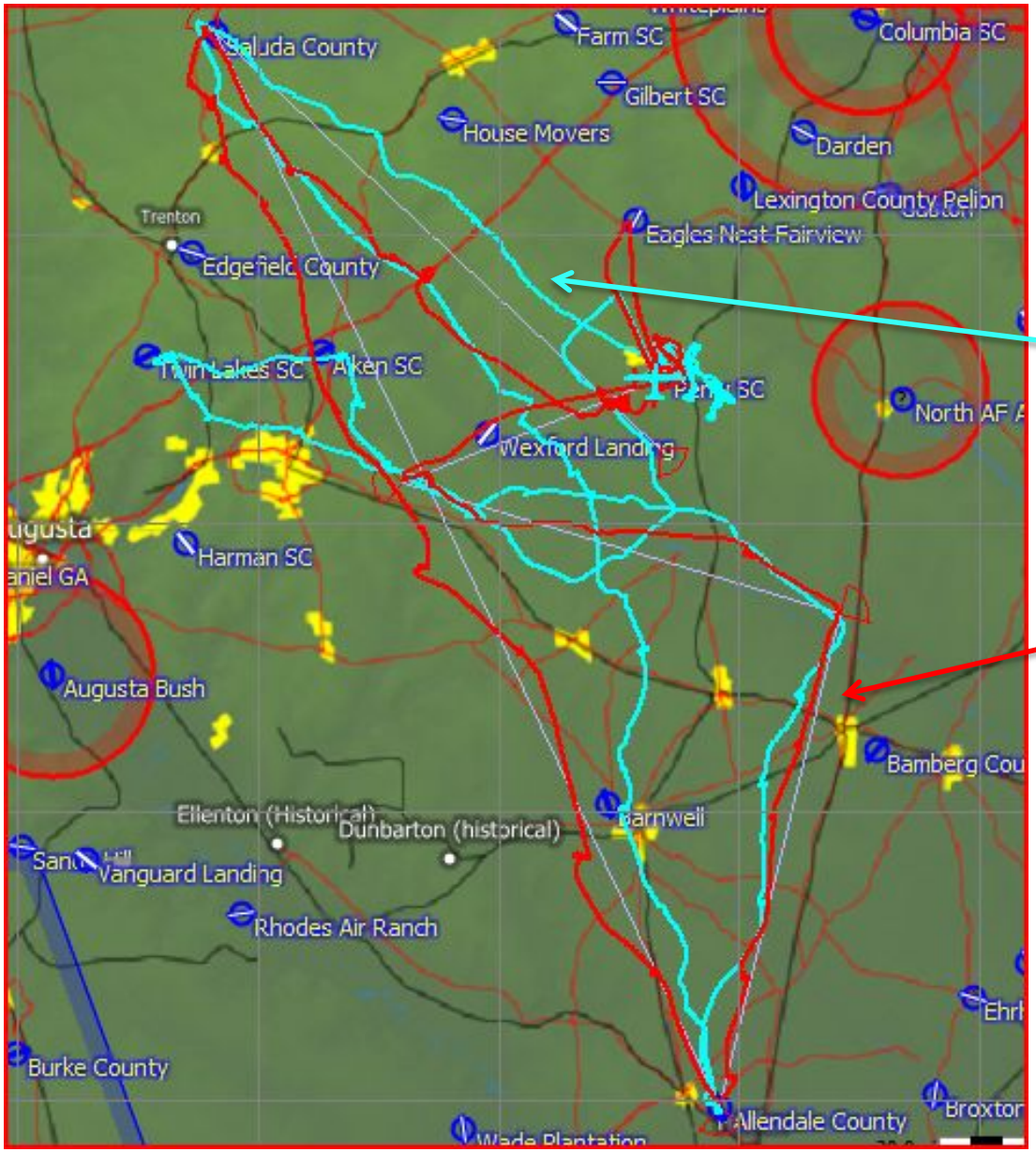
4. Follow the energy! By diverting to stay under the most promising-looking cl
long distances are possible without circling to climb.

# A Real Life Lesson

To bring this home, the next few slides compare two contest flights on the same day

One flight by JCG (AE) and one by Jerzy Szemplinski (XG) both flying ASG-29's at Perry, South Carolina on a very good racing day

# Efficient Flying – Perry, April 2013

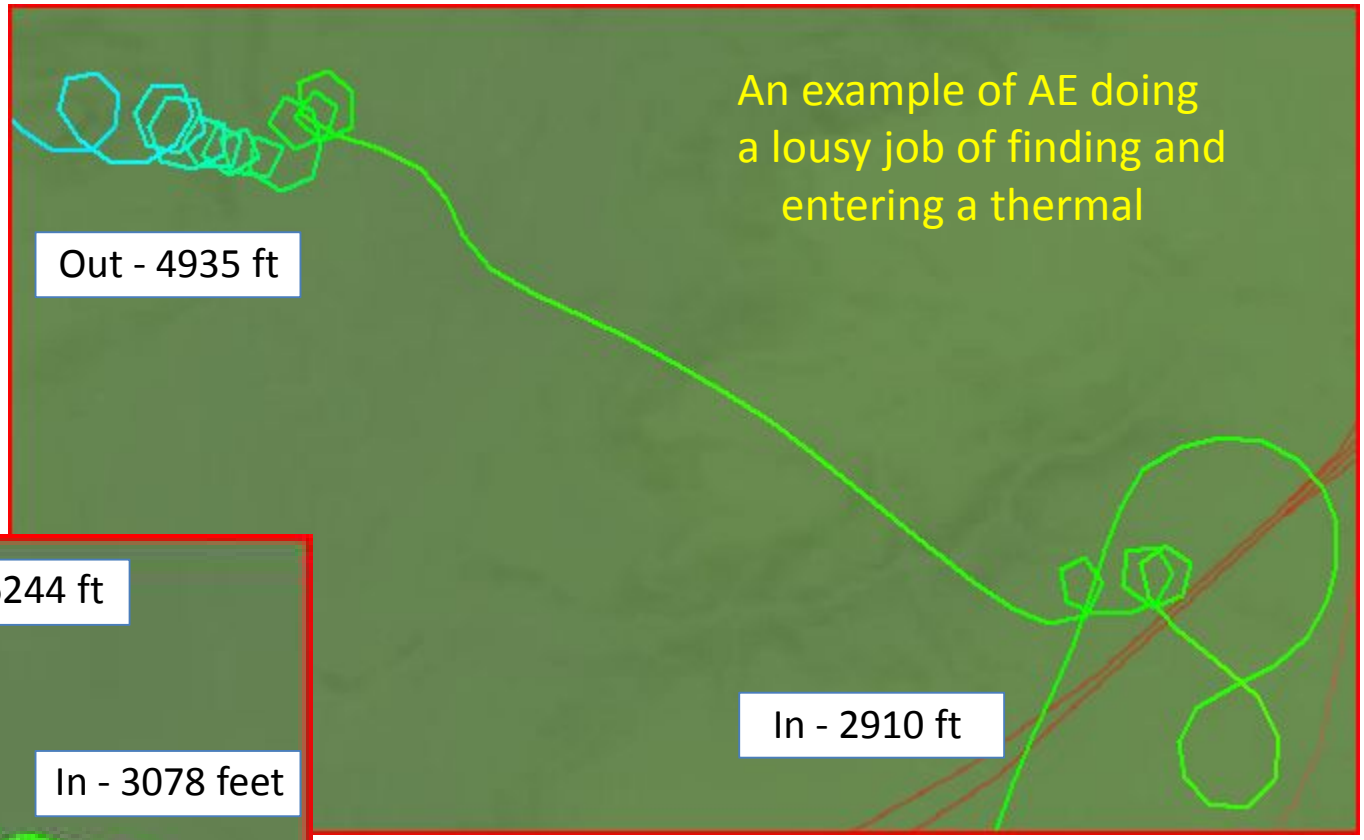


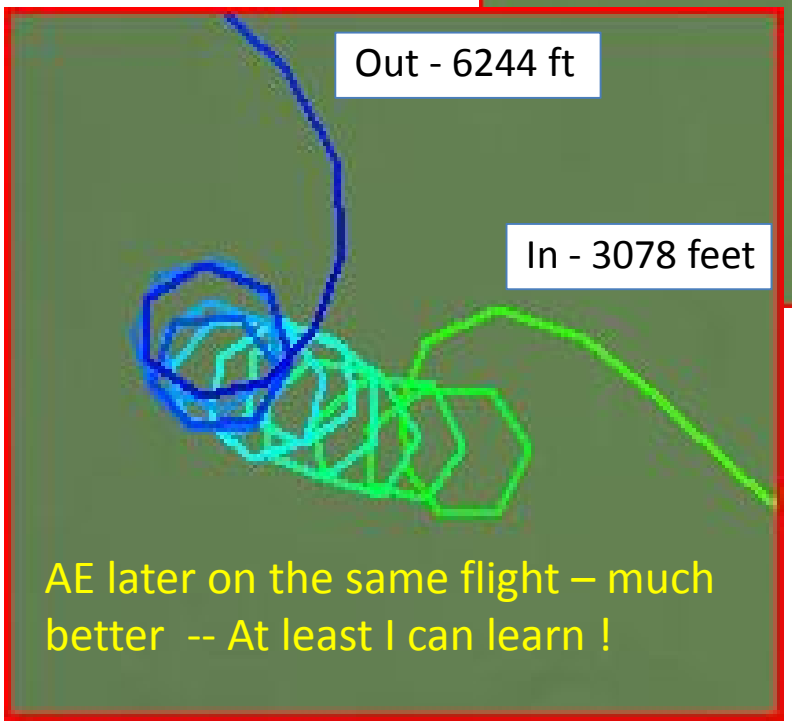

Course was a 3 turn
MAT – minimum time
3 hours

XG - 240 miles / 79 mph
In Cyan

AE - 197 miles / 65 mph
In red

# Efficient Flying – Example Thermal Entries



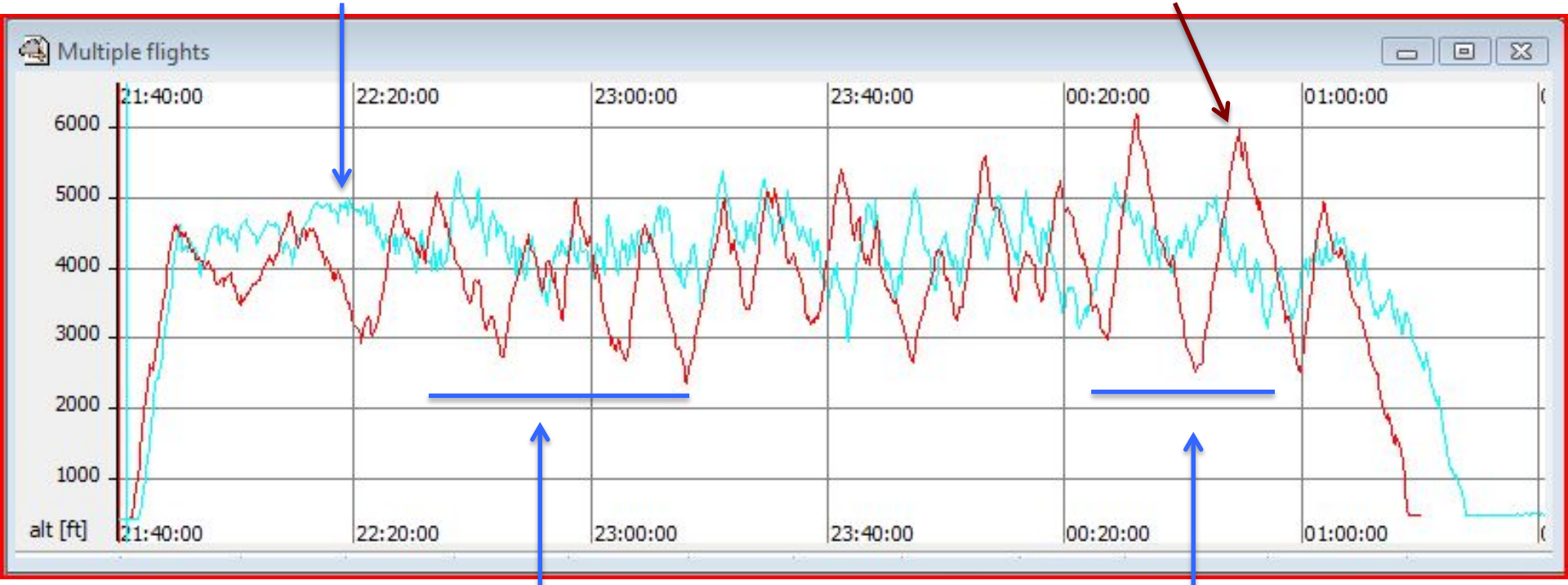

~ 3000 ft

~ 6000 ft

# Efficient Flying – Perry, April 2013

XG in Cyan

AE in Red




XG spent about
40 minutes cruising

AE running and climbing

XG spent about
30 minutes cruising

AE running and climbing
even higher (end of day)

# Efficient Flying – Perry, April 2013

**Flight statistics**

Maximum altitude gained: 3022ft, low point 2393ft at 21:47:02, high point 5415ft at 22:37:26

XG - 240 miles / 79 mph

| Circling: | Time | Vario | Alt.Gain | Alt.Loss | Thermals |
|---|---|---|---|---|---|
| Total | 00:42:32 (19%) | 3.3kts | 17215ft | -2789ft | 22 |
| Left | 00:39:28 (93%) | 3.3kts | 15719ft | -2608ft | 20 |
| Right | 00:03:04 (7%) | 4.2kts | 1496ft | -180ft | 2 |
| Tries (<45s) | 00:10:20 (5%) | 0.9kts | 2949ft | -2054ft | 12 |

| Straight: | Time | Dis.Done | Alt.diff | Netto | Avg.GS | IAS | Glides | Avg.Glide | Mean L/D |
|---|---|---|---|---|---|---|---|---|---|
| Total | 02:58:32 (81%) | 302.2mi | -16394ft | 3.1kts | 102mph | 96mph | 23 | 13.1mi | 97 |
| Rising | 01:01:04 (34%) | 89.7mi | 45860ft | 8.9kts | 88mph | 86mph | | | -10 |
| Sinking | 01:57:28 (66%) | 212.5mi | -62254ft | 0.0kts | 109mph | 101mph | | | 18 |
| Netto rising | 02:04:36 (70%) | 209.8mi | 22867ft | 5.9kts | 101mph | 97mph | | | -48 |

**Flight statistics**

Maximum altitude gained: 3917ft, low point 2362ft at 23:16:17, high point 6280ft at 00:32:09

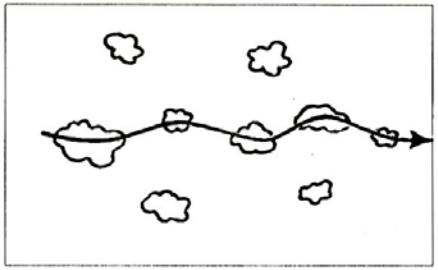
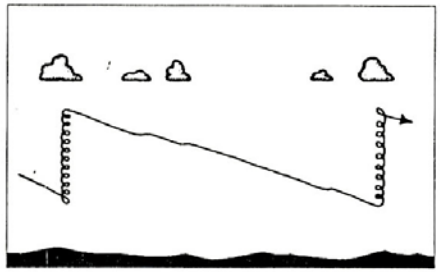
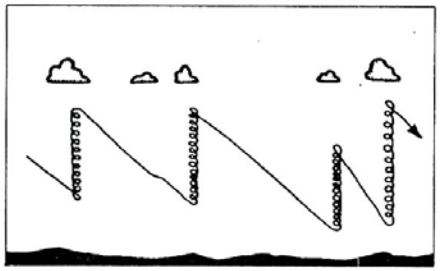
AE - 197 miles / 65 mph

| Circling: | Time | Vario | Alt.Gain | Alt.Loss | Thermals |
|---|---|---|---|---|---|
| Total | 01:14:04 (35%) | 4.1kts | 33698ft | -3100ft | 24 |
| Left | 00:37:44 (51%) | 4.0kts | 17343ft | -1857ft | 12 |
| Right | 00:36:20 (49%) | 4.1kts | 16355ft | -1243ft | 12 |
| Tries (<45s) | 00:02:36 (1%) | -0.1kts | 558ft | -591ft | 7 |

| Straight: | Time | Dis.Done | Alt.diff | Netto | Avg.GS | IAS | Glides | Avg.Glide | Mean L/D |
|---|---|---|---|---|---|---|---|---|---|
| Total | 02:18:52 (65%) | 228.7mi | -32792ft | 1.3kts | 99mph | 94mph | 25 | 9.1mi | 37 |
| Rising | 00:32:00 (23%) | 48.5mi | 13497ft | 6.5kts | 91mph | 88mph | | | -19 |
| Sinking | 01:46:52 (77%) | 180.2mi | -46289ft | -0.2kts | 101mph | 95mph | | | 21 |
| Netto rising | 01:22:36 (59%) | 135.5mi | 302ft | 3.8kts | 98mph | 94mph | | | -2369 |

# Practice – Practice & Useful Thermaling Exercises

- Set up small tasks around the airport
- Practice thermal entry and centering as you fly the task
- Fly on good days first and then on weaker days
- Fly on Blue days
- Analyze your flights with See You
- Try to find the Energy lines

| TASK | | AIM OF EXERCISE |
|---|---|---|
| 18. Vary your heading to minimize height loss. The proportion of flight-time spent circling should be as low as possible, but you should not use too conservative a speed-ring setting. |  | 18. Small changes of heading can save height and therefore minimize time spent circling. |
| 19. Turn as infrequently as possible, by "following the energy" and prolonging the glide, i.e. using a moderate speed-to-fly ring setting (e.g. 150 fpm) and a deep cruising band. Try to circle only in exceptionally strong thermals. |  | 19. To improve average speed by reducing time spent circling in thermals and therefore time spent getting established and centered in them. Practice in "tactical undersetting of speed-to-fly ring." |
| 20. Fly deliberately with your speed ring set too high. Abandon the game before you are forced to land out. |  | 20. To practice flying aggressively, e.g. to enable you to maintain contact with a leading gaggle on a blue thermal contest day. To recognize in good time the risk of landing out when flying in this manner. |

# End