

The Start/Finish and Turnpoints



The Start

The aim is to cross the start line with as much energy as possible.

At the inter-services you can start either by;

- 1 Crossing the start line.
- 2 Climbing through the maximum declared start height in the D.

But neither before the start line is open! Although you might do a practice start.

- 3 Look ahead for a good line to give a good first leg, which is often into wind!
- 4 Be prepared to be well off the centre track to achieve this.
- 5 Put yourself in an efficient start position so that you cross the start line as high as allowable, with excess speed if possible and with the shortest distance to the good line at max weight.
- 7 Ideally with a few gliders a few minutes ahead of you. That way you shouldn't come last!
- 8 Best is to be maintaining height at just below max start height crossing the line fast and then pulling up to your chosen cruise speed.
- 9 However you won't be the only one doing this so some compromise might have to be made. You can easily gain a minute on a good start, the significance of speed is explained later.

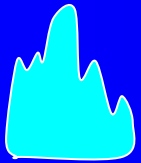
The Start

Some feel the need to go off down the first leg and try out the air!

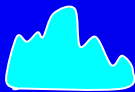
Why would the air be significantly different from the air within 15 kms of the start area? Be hugely careful. The unusually strong thermal is unlikely to be there in 20 minutes time but then you will have marked it for early starters.

And finally if the sky suffers blue or spread out or showers you are quite simply in the wrong place at the wrong time. Stay in touch so that you are never more than 10 minutes away from being able to start.

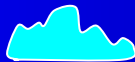
Better, I would suggest is to have a good look at the cloud you are initially climbing in especially its cloud top structure, then go off to a different looking cloud and guess the thermal strength in comparison to the one you just climbed in and finally look back at the original cloud from the new angle. Then make a judgement of the first leg. Continue this process (and modify) whilst hammering around the task!



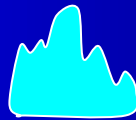
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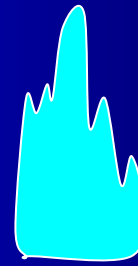
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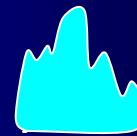
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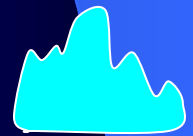
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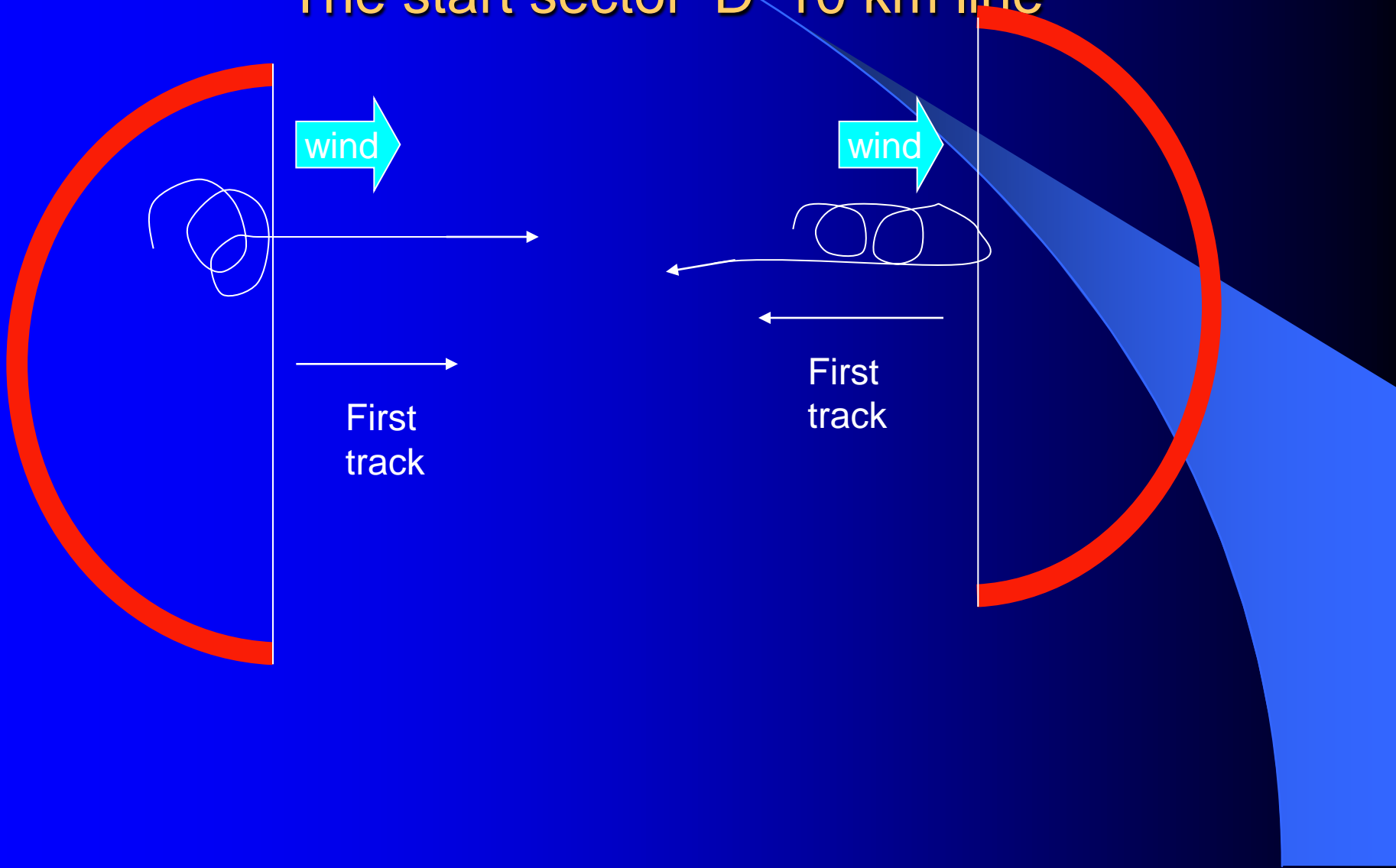
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4

Starting

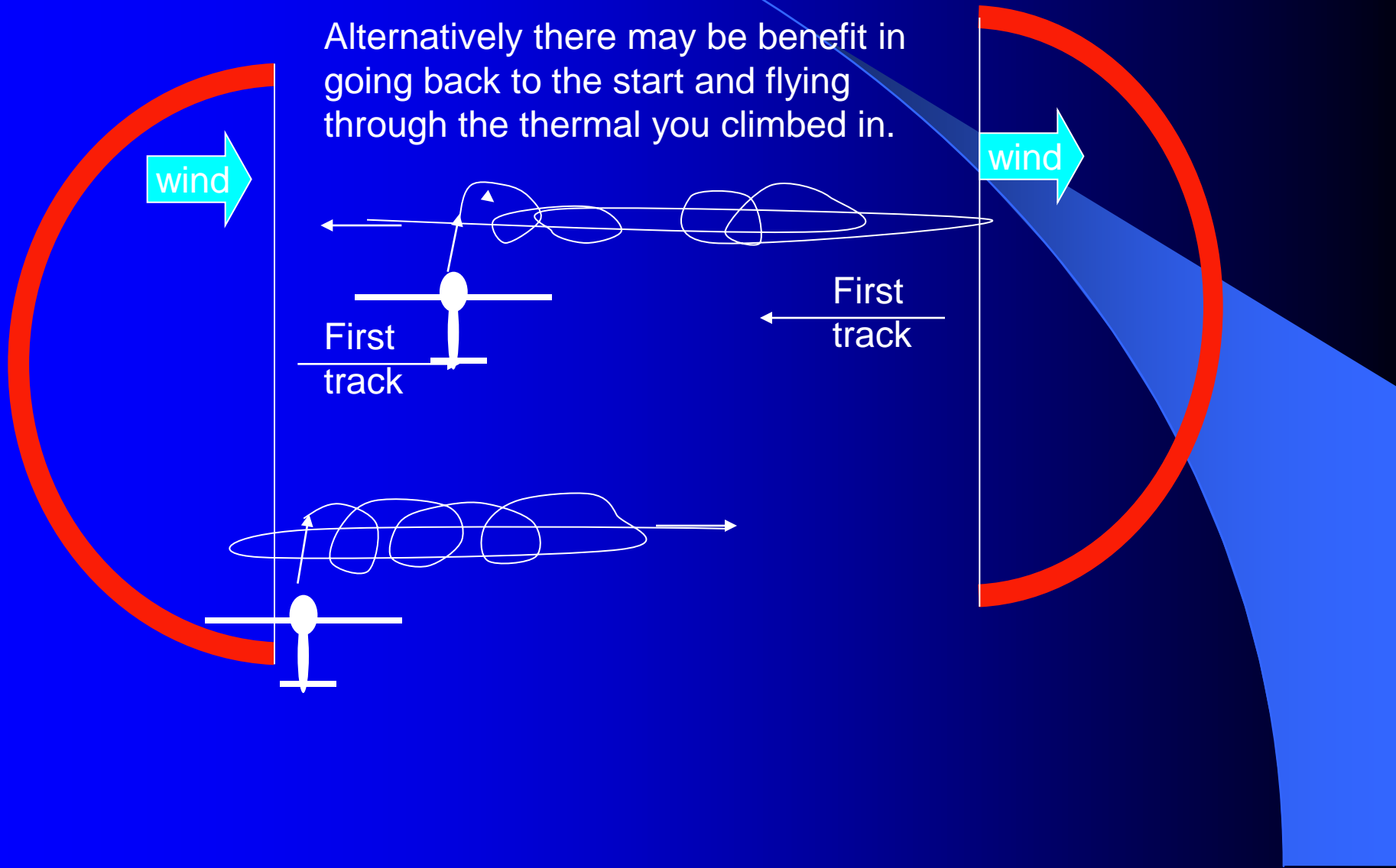
The start sector 'D' 10 km line



Starting

The start sector 'D' 10 km line

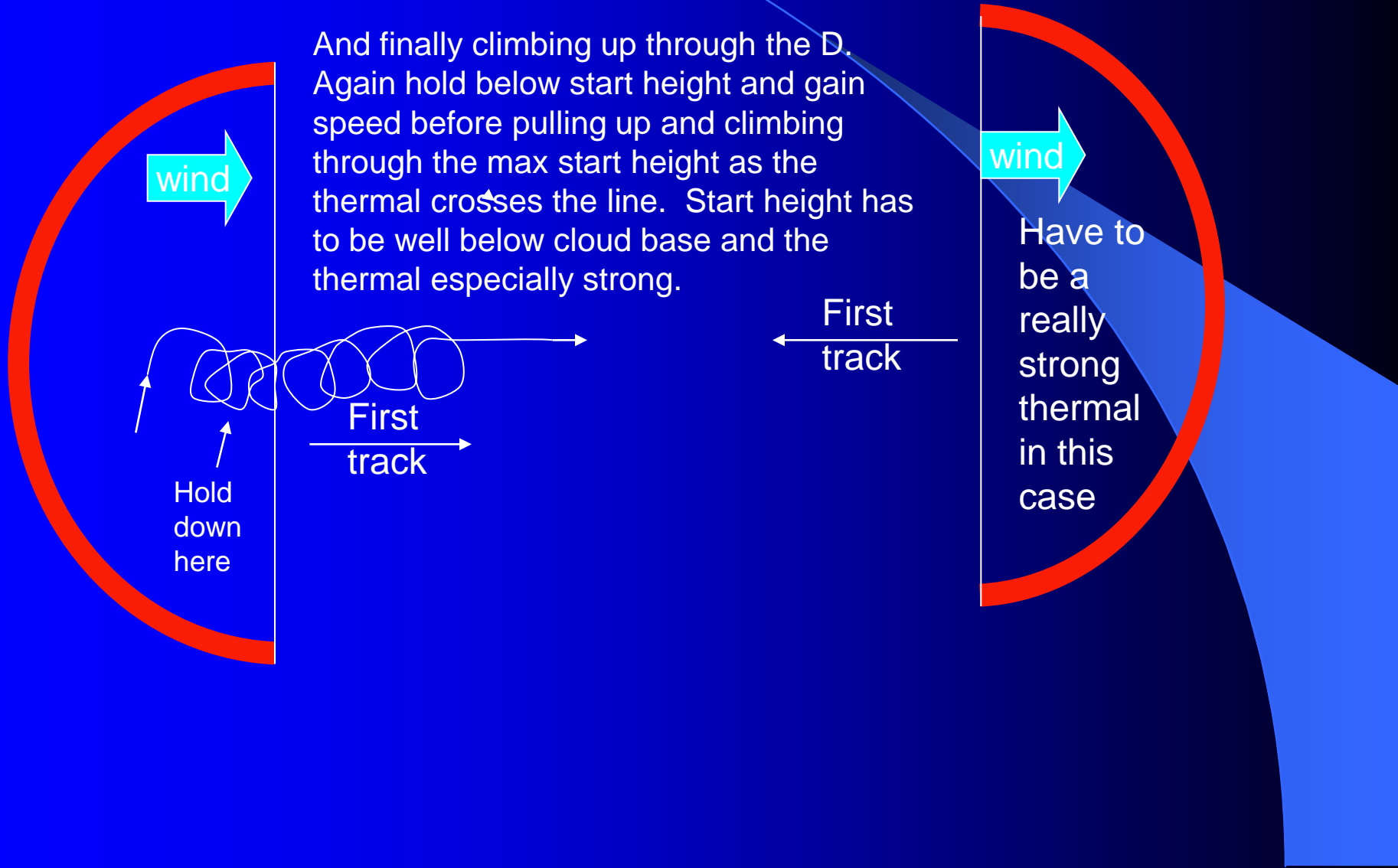
Alternatively there may be benefit in going back to the start and flying through the thermal you climbed in.



Starting

The start sector 'D' 10 km line

And finally climbing up through the D. Again hold below start height and gain speed before pulling up and climbing through the max start height as the thermal crosses the line. Start height has to be well below cloud base and the thermal especially strong.



wind

wind

Have to be a really strong thermal in this case

First track

First track

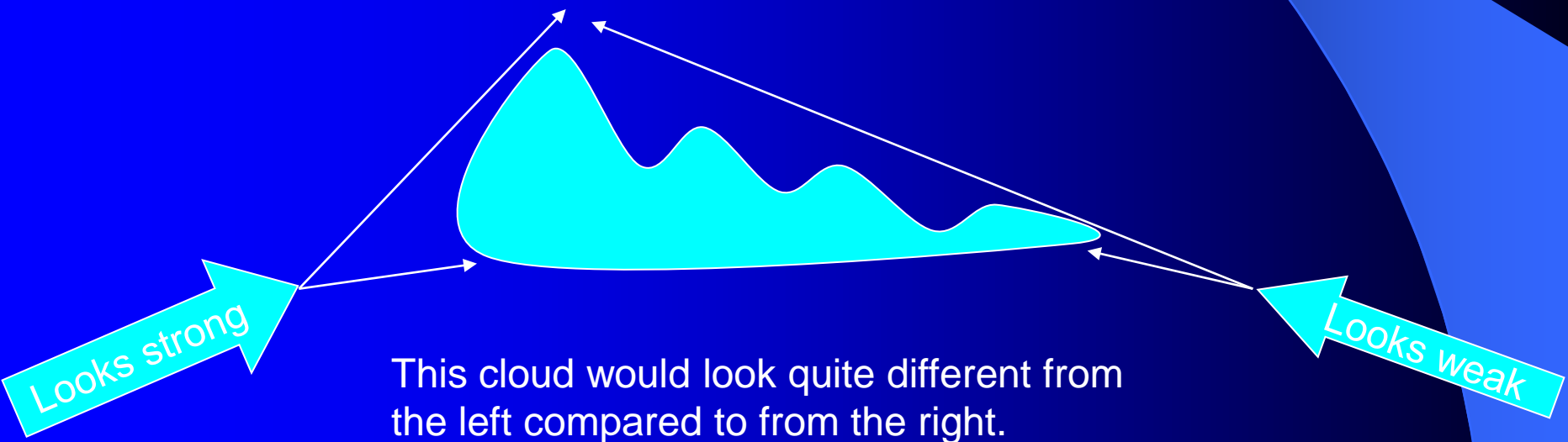
Hold down here

Turnpoints



Before the Turning Point

- Have a good look down the next leg.
- The clouds may be just the same but once on the new leg they appear different.



Down Wind Turn Points

- This one is simple. Climb so that as you drift into the turn point you reach the maximum height you can (cloud base or air space limits) before setting off on the next crosswind leg.
- OR Ideally you hit top of climb just before if your next track is back in to the wind so that you can bounce it running back on to the next track.

Into Wind Turn Points

- Much harder balance of safe - yet efficient.
- The simple solution is to be as low as possible so that huge time is not wasted.
- A generally 'safe' height is half way between cloud base and the ground. So a 3000' cloud base means 1500'.
- Mind you, you won't catch me being that high!
- Equally important is the speed you fly to get to it. I fly it as a final glide but to hit the turn point at a particular height. The LX does not make correction for the winds on task (but see you and Ipaq do) but shows you the wind separately so it only shows the MacCready (+ bug + weight) speed to fly.
- Herewith an exaggerated example for clarity.

Into Wind Turn Points

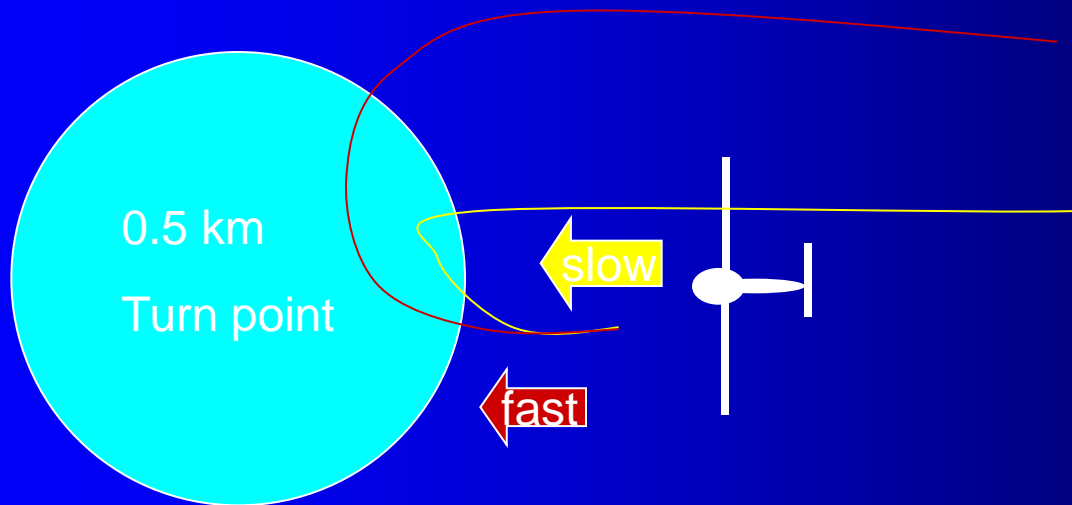
- Imagine the wind is 45 knots and you have just 2 nms (4 kms) to go to the turn point.
- Best glide (zero McC) is about 50 knots but that gives a 5 knot ground speed, therefore it would take 24 minutes to reach.
- That is a height loss of about **2400'**.
- At 55 knots (ground speed now 10 knots) it takes 12 minutes.
- At 60 knots (ground speed now 15 knots) it takes 8 minutes.
- At 65 knots (ground speed now 20 knots) it takes 6 minutes.
- At 70 knots (ground speed now 25 knots) it takes 5 minutes.
- At 75 knots (ground speed now 30 knots) it takes 4 minutes
- In the last example height loss about **800'**.

Into Wind Turn Points

- Imagine the wind is a more normal 20 knots and you have just 6 nms (12 kms) to go to the turn point.
- Best glide might be 50 knots but that gives a 30 knot ground speed which would take 12 minutes to reach. That is a height loss of about **1200'**.
- At 55 knots (ground speed now 35 knots) it takes 10:30 minutes.
- At 60 knots (ground speed now 40 knots) it takes 9 minutes.
- At 65 knots (ground speed now 45 knots) it takes 8 minutes.
- At 70 knots (ground speed now 50 knots) it takes 7 minutes.
- At 80 knots (ground speed now 60 knots) it takes 6 minutes
- In the last example height loss about **750'**.
- So you see, just like span, speed is good.
- The stronger the wind and the weaker the thermals then the more important it is to get this right.
- Remember that the wind is usually stronger at height.

Turning at the Turn Point

- Of course turning at the turning point at 80 knots gives a rather large turn radius (250 metres) and is inefficient so better at 0.7 kms to pull up to slow down and then turn. (At 60 knots in nil wind you are 6 seconds from the sector and it takes the Duo 3 seconds just to get the bank on) This gives a much smaller radius turn (100 Metres) and uses less height.



Turning at Turn Points

- You can start turning before you actually enter the 'beer can' type turn point and a good guide is to start at 0.7 kms to go - if you are coming back on yourself.
- From the earlier table a turn using 45 degrees of bank at 60 knots is close to 100 metres (0.1 of a KM). This is only true for nil-ish wind days. On windy days it is worth making an allowance for the wind. At height TAS will be faster and turn radius larger.
- Of course delay (to 0.6 or less) for an into wind TP but you will (should) be flying fast so a pull up to correctly slow for the next leg if searching for thermals will soon reduce wasted energy going the wrong way.
- On a down wind turn point you are likely to be slow so turn at 0.7 and accelerate after the turn is almost complete.
- What ever you do though, you can't afford to miss it and have to go around again.

COMP TURNING POINT

Track In

0.5 Km

Track Out

Caxton Gibbet, Papworth Everard, CB23, UK



FIA TURNING POINT

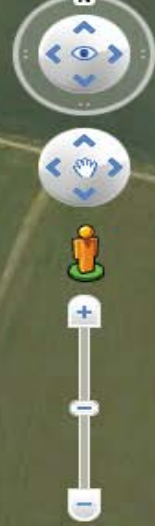
Track In

Track Out

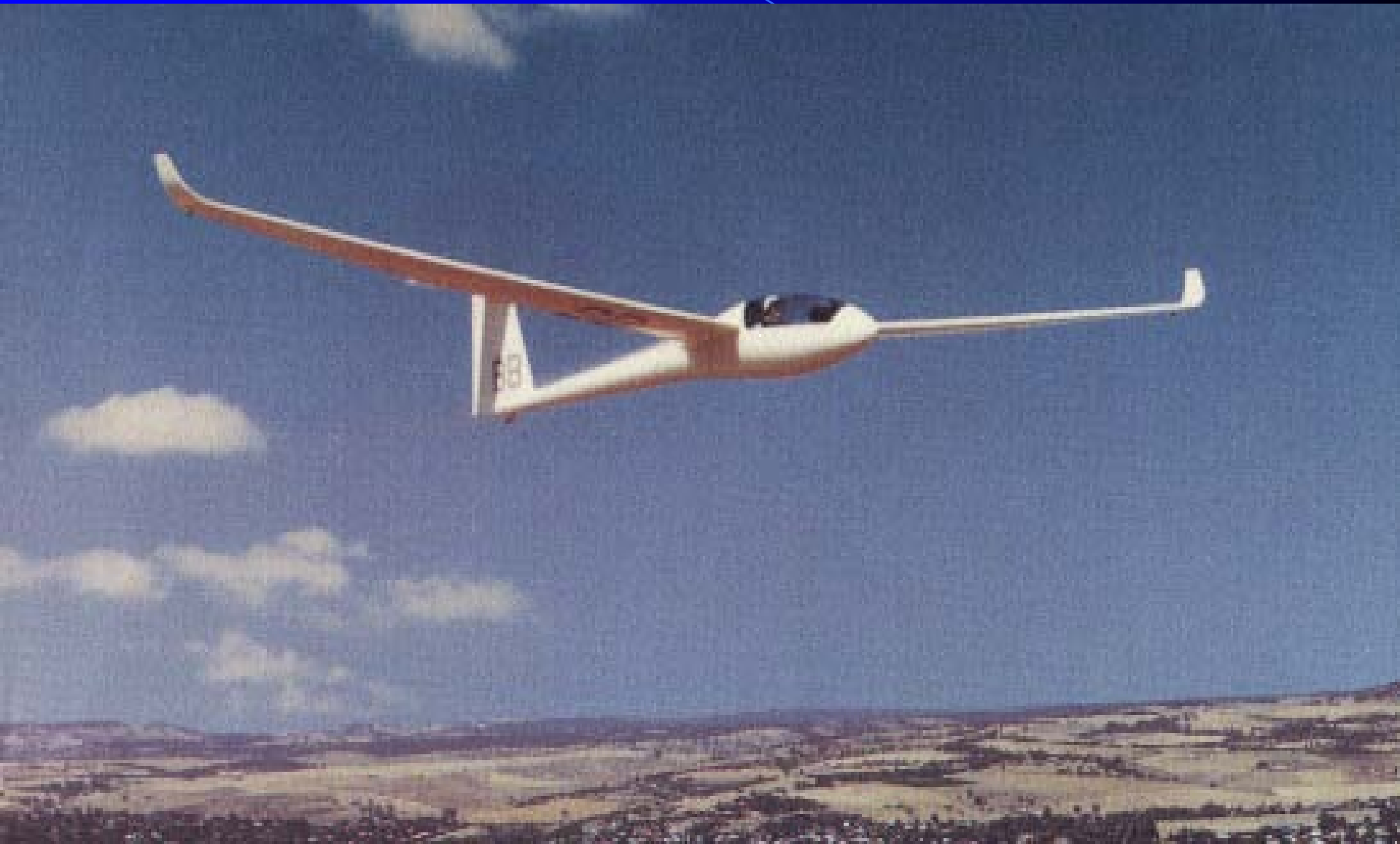
45 Degs Bi-sector

45 Degs Bi-sector

Caxton Gibbet, Papworth Everard, CB23, UK



Final Glides



Final Glide

- So you just start to climb and the LX says you can make it.
- It is time then to wake up and smell the

● **DANGER**

- You will be tired and elated by far!

Final Glides

Know where the final glide might occur on the task. This gives you a target to aim for, to feel confident about the final glide.

Must establish a safe final glide without any chance of having a late field selection, landing short. A finish score >900+ becomes a land out score of <600.

Dial in expected MacCready (3 dry / 4 wet – never less) usually to cruise about 80 knots (DRY), (Duo) plus a safety on top and then drive in.

If gaining on the glide dial up higher MacCready but do not pull up;

If losing out it could be serious, dial down immediately to 3 on the MacCready to HOLD the safety margin! If this fails it ‘probably’ means you have to climb again!

The perfect finish is a SLIGHT acceleration for the last few miles burning off some of the safety margin and of course being the fastest on the day! On a normal day for the Duo this works out at about 100 feet per kilometre, plus margin.

The margin depends on how far away and how high from the finish and the prospective good or bad conditions for the home run and the wind.

Just because people shoot off early does not make it necessarily a good idea to follow the crowd. Stick with your own safe and confident plan.

So 40 kms out is 4000 feet plus say 400 feet margin. More about safety margins later.

Watch the gliders ahead who set off before you on the glide and see if they pull up to show good areas. If they start climbing in weak lift then make a more efficient glide early. Do not just blindly fly on track, deviate if there is an obvious advantage to do so.

Do you really think you have just understood what to do?

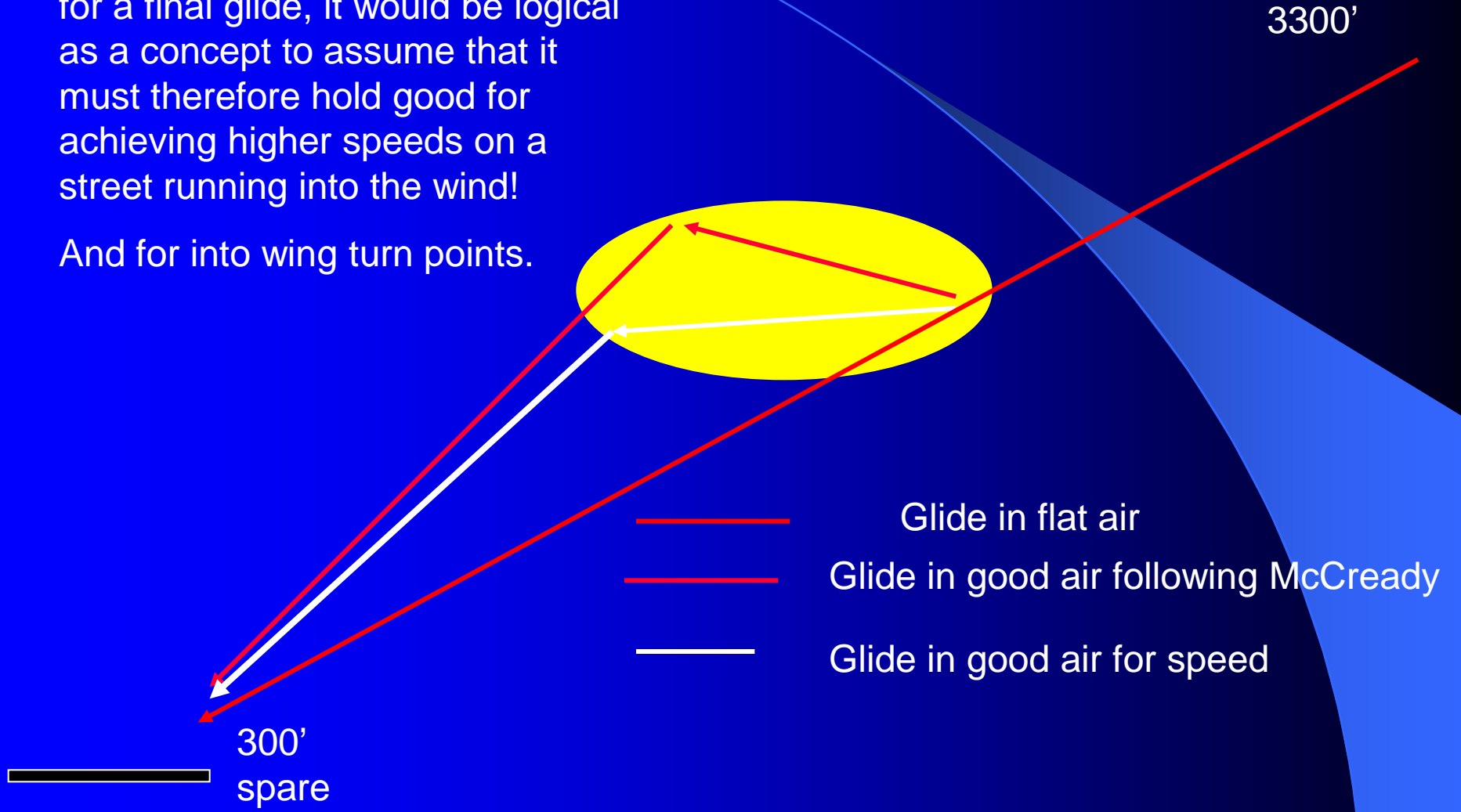
Final Glide

- One such danger is the and what the LX is actually telling you.
- The LX is simply a computer and you must understand the short falls.
- It assumes that you have entered the current QNH, correct weight, that the air ahead is standard, that the glider is really polished and it tries to give you a realistic compensation for the wind on the final glide, but it is only a simple calculator and does not (it can not) give you the full picture in terms of height needed to get in. Look out of the canopy and Bring back the John Willy!
- How accurate is the altimeter at height and how much lag do you get on the run in. A slight tap 'by' the altimeter can make an okay looking final glide into the loss of most of your safety height in a blur! So tap it before you set off and remember you will 'lose' a bit in the acceleration.
- The LX does not know the sea breeze is now blowing in your face. If in doubt ask control for the surface wind.
- To simply set a lower MacCready so the numbers appear to work and slow down so that it infers that you can now make it is, simply not good enough.
- So a confident start to the final glide is a must and not become oops!

Final Glides

Whilst this argument holds good for a final glide, it would be logical as a concept to assume that it must therefore hold good for achieving higher speeds on a street running into the wind!

And for into wing turn points.



3300'

300'
spare

Glide in flat air

Glide in good air following McCready

Glide in good air for speed

Speed to Fly and Final Glide 10% rule!

Head Wind - Zero on the MacCready

DRY 50+wind

WET 65+wind

IAS	ROD	L/D	WIND 10	WIND 15	WIND 20	WIND 25
50	1.2	41.6	33.3	29.1	25	20.8
53	1.3	40.7	33	29.2	25.4	21.5
55	1.4	39.3	32	28.6	25	21.4
60	1.7	35.3	29.4	26.5	23.5	20.6
65	2.0	32.5	27.5	25	22.5	20
70	2.25	31.0	26.6	24.4	22.2	20
75	2.78	27	23.4	21.6	19.8	18
80	3.25	24.6	21.5	20	18.5	16.9
85	4.25	20.0	17.6	16.5	15.3	
90	5.2	17.0	15.4	14.4	13.5	

IAS	ROD	L/D	WIND 10	WIND 15	WIND 20	WIND 25
50	1.25	40	32	28	24	20
55	1.3	42.3	34.6	30.7	26.9	23
60	1.5	40	33.3	30	26.6	23.3
65	1.7	38.2	32.3	29.4	26.4	23.5
70	1.9	36.8	31.6	28.9	26.3	23.7
75	2.2	34	29.5	27.3	25	22.7
80	2.5	32	28	26	24	22
85	2.85	29.8	26.3	24.6	22.8	21.1
90	3.3	27.2	24.2	22.7	21	19.7
95	4	23.75	21.25	20	18.7	17.5

Final Glide Adjustments!

Consider a Final glide of 30 kms into a **10 knot headwind**

Height needed at 75 knots DRY	3846	L/D 23.4	14 minutes = 81'/min
Height needed at 60 knots DRY	3061	L/D 29.4	18 minutes = 20'/min
At best glide at 50 knots DRY	2702	L/D 33.3	22.5 minutes
	1144		81'/20' is safety feet / min
Height needed at 75 knots wet (Mac 3)	3050	L/D 29.525	14 minutes = 32'/min
Height needed at 60 knots wet	2702	L/D 33.3	18 minutes = 6'/min
At best glide at 55 knots wet (Mac zero)	2601	L/D 34.6	20 minutes
	449		
At 80 knots wet (Mac 4)	3214	L/D 28	13 minutes = 47'/min
Height needed at 70 knots wet	2848	L/D 31.6	18 minutes = 14'/min
At best glide at 55 knots wet	2601	L/D 34.6	20 minutes
	613		

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	449		
			3 minutes at 2 knots = 600'
At 80 knots wet (Mac 4)	3214	L/D 28	13 minutes = 47'/min
Height needed at 70 knots wet	2848	L/D 31.6	18 minutes = 14'/min
At best glide at 55 knots wet	2601	L/D 34.6	20 minutes
	613		47'/14' is safety feet / min

Final Glide Adjustments!

Consider a Final glide of 30 kms into a 20 knot headwind

Height needed at 75 knots dry	4054	L/D 19.8	16 minutes = 37'/min
Height needed at 60 knots dry	3829	L/D 23.5	22.5 minutes = 16'/min
At best glide at 50 knots dry	3600	L/D 25	30 minutes
	454		
DO NOT DUMP WATER EARLY!	YOU	MIGHT	NOT GET IN!
Height needed at 75 knots wet (Mac 3)	3600	L/D 25	16 minutes = 15'/min
Height needed at 60 knots wet	3383	L/D 26.6	22.5 minutes = 1.5'/min
At best glide at 55 knots wet (Mac zero)	3345	L/D 26.9	26 minutes
	255		
AGAIN - DO NOT DUMP WATER EARLY!			
At 80 knots wet (Mac 4)	3750	L/D 24	15 minutes = 27'/min
Height needed at 70 knots wet	3422	L/D 26.3	18 minutes = 4'/min
At best glide at 55 knots wet	3345	L/D 26.9	26 minutes
	405		

Final Glide Adjustments!

Consider a Final glide of 30 knts into a 20 knot headwind

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	405		
How accurate is the wind?			

Speed to Fly and Final Glide

Tail Winds - Zero on the MacCready

DRY

WET

IAS	ROD	L/D	WIND 10	WIND 15	WIND 20	WIND 25
50	1.2	41.6	50	54.1	58.3	62.5
53	1.3	40.7	48.4	52.3	56.1	60
55	1.4	39.3	46.4	50	53.6	57.1
60	1.7	35.3	41.2	44.1	47	50
65	2.0	32.5	37.5	40	42.5	45
70	2.25	31.0	35.5	37.7	40	42.2
75	2.78	27	30.6	32.4	34.2	36
80	3.25	24.6	27.7	29.2	30.8	32.3
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90	5.2	17.0	19.3	20.1	21.2	22.1

IAS	ROD	L/D	WIND 10	WIND 15	WIND 20	WIND 25
50	1.25	40	48	52	56	60
55	1.3	42.3	50	53.8	57.7	61.5
60	1.5	40	46.7	50	53.3	56.7
65	1.7	38.2	44.1	47	50	52.9
70	1.9	36.8	42.1	44.7	47.4	50
75	2.2	34	38.6	40.9	43.2	45.5
80	2.5	32	36	38	40	42
85	2.85	29.8	33.3	35.1	36.9	38.6
90	3.3	27.2	30.3	31.8	33.3	34.8
95	4	23.75	26.3	27.5	28.75	30

Height!

- There are three heights measured on your altimeter you need to be aware of before you go cross country.
- QFE – This is what we normally fly on when we fly from the local airfield. The altimeter will read zero when the glider is on the ground. Be aware that the pressure can change during the day (3 millibars (100') would not be unusual) and may be several millibars different after several hours. If you are on task during this period then you are no longer necessarily as high as the altimeter indicates if you are now on final glide! Military Airfield zones are based on this.
- QNH – With this setting the altimeter indicates height above mean sea level (AMSL). With a map indicating ground heights you can then estimate your height above the ground were ever you happen to be, by taking off the height indicated on the map off what your altimeter indicates. Some restricted airspace and danger areas are measured using this setting. Civilian airfields normally use QNH. In a competition one specific pressure will be given at briefing which is the one they use at the end of the day for scoring penalties for airspace infringements.
- 1013 – Standard Pressure Setting – This is the setting you need to avoid controlled airspace (airways) as the airliners fly on this setting.
- Caution – If whilst on task you ever change away from the setting you took off on, then make sure you change back. Better still, call the finish line to get the latest wind and QFE.

Final Glides

- Remember that every time you move the stick or rudder you are using energy, either loss of height or loss of speed and what is often forgotten loss of smooth laminar flow (wing efficiency) which is further not helped by rough air.
- Turbulent air contributes to a significant loss of glider aerodynamic efficiency. You will know how a boat struggles in a rough sea or a skier over moguls, or car over rough ground (the airfield) is slow. To me it is possibly why some very good national pilots manage to be the fastest up to 1 km short of the field.
- If in doubt because you are thinking of setting off on a bouncy final glide with not a lot spare, put a bug factor in to the LX. Otherwise the LX reads the increased rate of descent (due to the inefficiency) as sink and demands that you fly faster and assumes mathematically that you will get into better air and recover the loss once out of the bad air.
- Make sure too that if you dumped some water that you told the LX about it or yet again you will be flying too fast for the lighter weight and the performance against the wind will be less.
- If a small detour on the final glide will give obvious good air, then always use it, as the alternative line is likely to be poor.

Speed in Perspective

- Consider a final glide in nil wind cruising from 3250 feet (30 kms) to the finish and crossing the line at:
 - 1. 700 feet at 60 knots (120 kph) - will take 15 minutes.
 - 2. The same cautious cruise but with a late dash close to VNE at the finish line at 50 feet will take 13 minutes.
 - 3. A managed final glide at constant speed (80 knots) with a straight in safe approach at good high speed cruise will take 11 minutes. Hence the brakes, then gear straight –in approaches. (gears have speed limits).
- This example does show how an overly cautious final glide can easily cost you 2-5 minutes on each race day (therefore times 9), overall a lot of speed points and positions. Over caution into a head wind can make it worse. BUT caution, it is also another reason why some very good pilots in Nationals consistently win or actually be the fastest to land short by 1 km.

Final Glide Practice

- Now that you recognize that it is important to fly an efficient, safe, final glide, you need to practice it many times before the comps! The comps is not the time to start learning anything new!
- Set a simple task on a flat day, best on the run allowing straight-in to land.
- CRA-LEH-CRA or for the westerly run CRA – Digby – CRA.
- This will need less than 1000' in the Duo or LS8, a little more in the Discus. The additional height gained on the launch is your safety height which you will now learn to better manage on the final glide, albeit only over 14 kms but it proves the point nevertheless.
- Making sure that the LX altitude (QNH) is set correctly, off the wire fly the task with zero on the MacCready and see how accurately the glider instruments (LX) (altimeter/lag) relate to the actual performance achieved. (Weight and dirty wings!) Also note with a stop watch the actual time it takes flown at best glide speed. Did I say pitiful speed!
- Now re-fly the task with 2 or 3 or 4 set as appropriate in the MacCready and again note instrument accuracy and time taken. Even if the LX has not calculated the wind accurately the gain outbound will be lost inbound. On the first launch (Mac at zero) you will get an idea of how high you might start and how much spare you have to play with. Simply wind up the MacCready so that the height needed to do the task is a little less than this and you should get back! Allow a bit for the turn and grandma and turn at .7, don't wait until you are in it. This should also improve your turning point skills. Don't be shy of trying it with dirty wings, another lesson might be learnt!

TP / Final Glide Practice

- Now considering the earlier points about flying the correct speed in to into wind turning points then this can be practised but not as a final glide as you will be recovering to the airfield down wind and we don't do downwind landings. The practice of achieving the turn point efficiently and accurately is well worth it.
- Flying at high speed to the up wind turn point and then slowly back in the tail wind to prove the optimum cruise speed on into wind legs and turn point to use in certain known wind strengths and the correct timing for the pull up and turn is beneficial. Out on task of course you would now be looking for a thermal.
- For down wind turn points you have already done this whilst on your practice final glides.

Final Glide Practice

- This exercise will give you confidence in the LX system, teach you what a controlled straight-in looks like to improve your judgement and improve your cross country speeds achieved on any task and points/placing in a competition. In a 9 day comp that could mean as much as 300 to 500 points earned or lost- for nothing other than flying an efficient safe final glide!
- This exercise can be practised many times and different techniques may be incorporated. Do not bounce as the flight director suggests. Simply pick a nominal speed and fly smoothly. Remember that if you encounter lift on such a glide you **MUST NOT** pull up and **SLOW** down, just cruise through (but you can deviate left or right) and after the lift fly a little bit faster with the extra energy gained for the remainder of the run in. Keep a record of all spare height and run times.

In the Duo DRY the following speeds are flown with the associated MacCready settings:

- Zero=55+ 2=70 3=75 4=80 5=85 6=90
- A DVD showing this - is available.
- By the way on turbulent days the performance of any glider deteriorates as the otherwise smooth laminar flow is disturbed, causing an increase in drag.
- PS. Tell the Duty Inst what you are doing and don't forget the wheel (WULF) as you will be doing a straight in from 6 kms.

Failure and Penalties

- To fail by incurring a start sector, turn point error, land out or incur any penalties in a competition destroys all your otherwise good efforts.
- You must complete the start, turn points and finish lines correctly.
- If anybody finishes the task – it must be you.
- Airspace penalties are now severe!
- Know you altimeter settings.