Strategic Decisions to Improve Your X/C Speed

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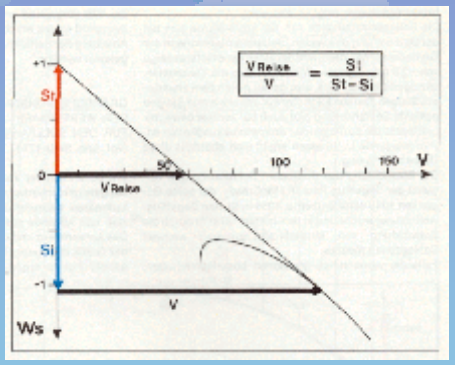
Graphics from Helmut Reichmann's Streckensegelflug

Why Speed?

- Speed is a factor for any distance greater than 400 km
- Every contest is a race
- Speed is the measure how effectively we are utilizing the available energy in the atmosphere

What Speed to Expect?

- Depends on lift and glider performance
- Important for task planning
- Based on MacReady – try to beat it

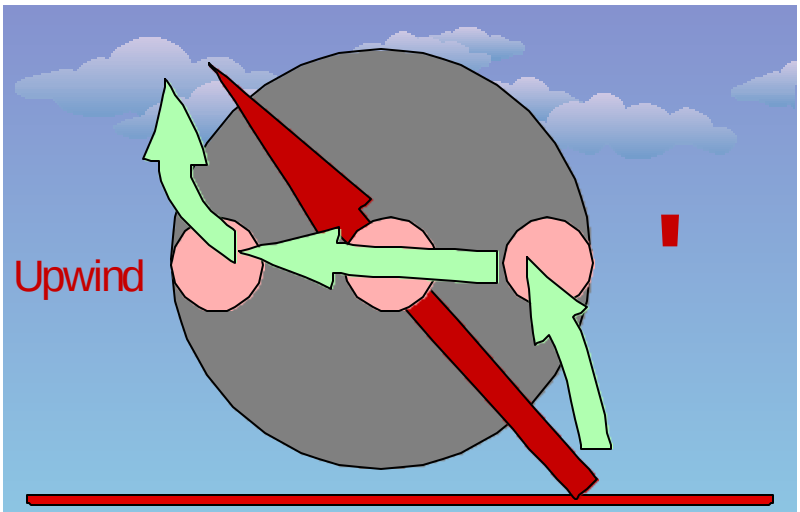


Decisions Affecting Your Speed

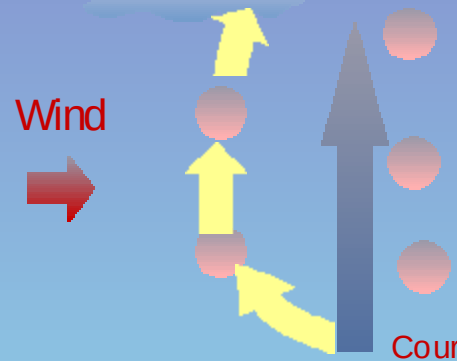
- Route
- Ring Setting
- Ballast
- Final Glide

What is the Best Route?

- Fly the lift – maximize straight climbs
  - Follow terrain features
    - High Ground (high = dry)
    - Ridges
  - Cloud Streets
  - Lake Fronts
- Take the upwind thermal
- If you have to stop – find the strongest lift – the race is in the climb not the run

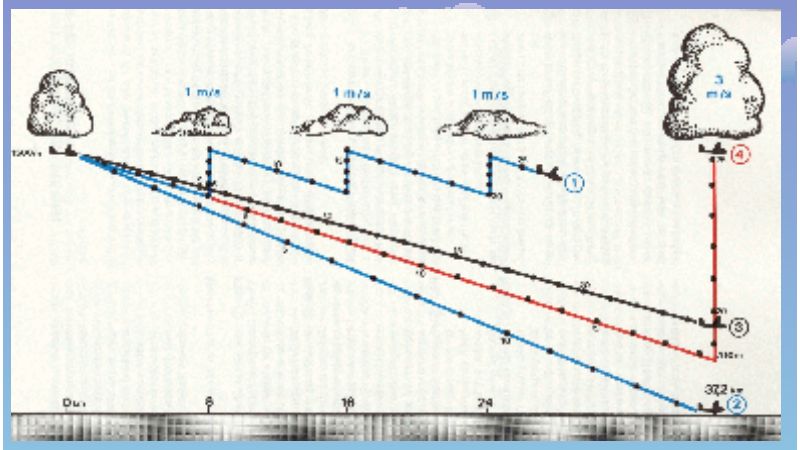


Deviations – which Side?



What Ring Setting?

- The classic speed to fly model (MacReady)
  - Ring setting according to the expected lift in the next thermal
- Limitations
  - Assumes unlimited height – the next thermal with the expected lift will be reached
- Real life is different!



The Luck Factor

Managing the Statistical Odds

- Your chances to find strong lift improve with range
  - Assuming your chance to hit a 4kt thermal within 1 km is 5%
  - 10 km -> 52%
  - 20 km -> 77%
- Sometimes it makes sense to trade speed for range
- Be conservative when low – low range
  - John Cochrane: MacReady Theory with Uncertain Lift and Limited Altitude
- Higher performance gliders allow higher ring settings

Wrong Setting – What is the Loss?

The 2-3-4 Rule

Speed Ring Setting (kts) \ ACTUAL	0	1	2	4	6	8	Loss of Range (ASW 19)
5		22%	7%	1%		2%	35%
4			4%	0%	1.5%	4%	26%
3		7%	2%	0.5%	3%	8%	20%
2		3%	0%	2.5%	8%		11%
0			10%	20%	30%		

Summary

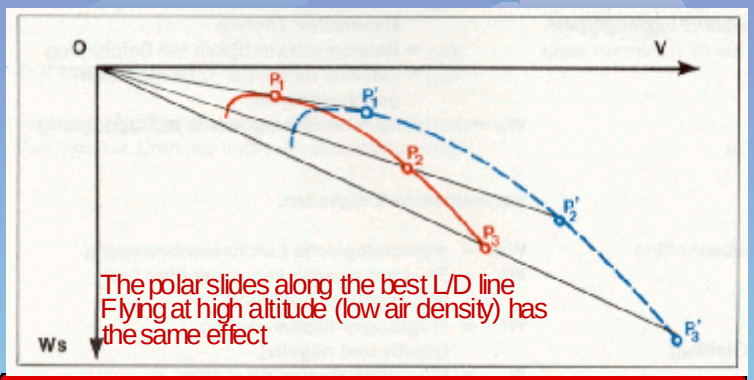
- Know the limitations of the model you apply
- The precise setting of the speed ring is not important
- Conservative ring settings increase your chances of finding better lift (or lift at all)
- Reduce the ring setting as you get lower
- Do not set the ring to zero (losses too high!)
- Do not thermal in lift below your current ring setting
- There are no “hard and fast rules” everything depends on the circumstances

Water or no Water?

Effects of Ballast

- Increased speed in the glide
- Better L/D at high speeds
- Increased minimum sink – reduced climb rate
- Increased turn radius – more difficult to core

Effects of Ballast



When does Water Make Sense?

- In strong conditions
  - Thermal average more than 4 kts
  - Smooth lift – wide cores
- Linear lift – no need to circle
  - Ridge
  - Wave [caution: freezing!]
  - Streets
  - Lake fronts

Common Mistakes

- Water kept too long
  - The speed advantage is obvious, the climb penalty is not
  - Dropping is irreversible
  - Lot of work to load
  - Drop as soon as you have difficulties climbing
- Water only used in contests
  - Water changes the handling characteristics of your glider
  - If you want to use water in a contest you have to practice with it

Final Glide

- Classic Model is the MacCready inverted
  - You fly the ring setting of your last thermal
- Inputs are:
  - Distance
  - Head wind component
  - Ring Setting
  - Rule of Thumb: 1000 ft per 10k (L/D: 30)
- Again, reality is different

Two Scenarios – what is the Difference?

- At 4:30 p.m. on a day with lift ranging from 3 to 6 kts you are 60km out, 6000 ft AGL, climbing in 5 kts – your final glide computer says you need another 1000 ft to be on final glide with a ring setting of 5 kts. Do you stay or go?
- On a weak day you are 7 km out, scratching at 600 ft AGL in 1 kt, you are high enough to make it home with best L/D (zero ring setting); for a ring setting of 2 kts you would need another 100 ft. How high do you climb?

The Difference is in the Chance to find Lift

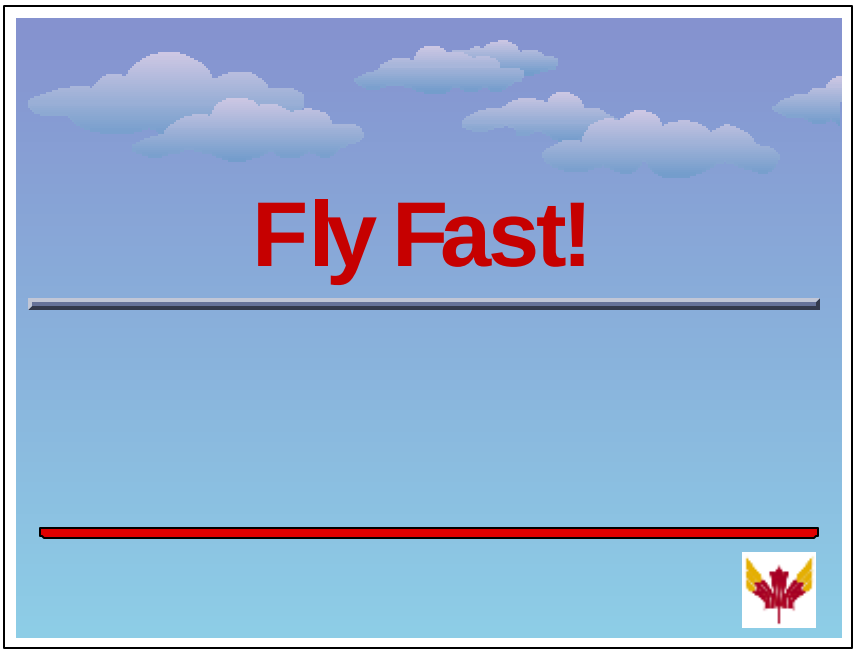
- Scenario 1: 60 k out, 6000 ft AGL
  - Over a distance of 60 km there is a good chance of
    - making up the missing 1000 ft by pulling up in thermals along the way
    - finding a 6 knotter
  - If it hasn't happened at the 3000 ft AGL level there is still plenty of opportunity to slow down.

The Difference is in the Chance to find Lift

- Scenario 2: 7 k out, 600 ft AGL
  - Within 7 km and below 600 ft there is very little chance to find usable lift
  - Once committed to the final glide there are no more options – if it doesn't work out you will likely break something.

Summary

- Be aggressive far out – be conservative when close and low
- You can afford to be picky – pick only the best lift
- Try to get to final glide altitude by pulling up in lift
- Re-evaluate at the 3000 ft AGL level
- High ring setting = high safety margin
- Use an arrival height you are comfortable with (min 500 ft)
- At 8 km (5 NM) out you are committed – if you are not absolutely sure to make the field, plan on landing out.


Fly Fast!