High or Low, It's 5:2

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We would like every approach to be at the perfect angle for the wind and other conditions, but that isn't always the way things work out. Sometimes we guess wrong on the conditions, encounter lift or sink, or misjudge our perceptions and we can end up either higher or lower than planned. So, which is worse and what ways do we have to recover from either situation?

Being too low.

The risk of being too low is not making it to the runway, landing short or colliding with obstacles in the approach path. If we collide with anything, we do so at flying speed.

The list of mitigations for a low approach is short: 1 definite and two maybes

1. Close the airbrakes
2. You are probably uncomfortably low on final approach due to unanticipated sinking airmass OR due to stronger than stronger-than-expected headwind OR perhaps both of these factors. The cure for each is STICK FORWARD to INCREASE AIRSPEED and minimize the length of time that these factors can adversely affect your flight path. In cruising flight, at altitude, we fly fast through sink - the same applies here. If a stronger-than-expected headwind on final approach contributed to being too low, increasing airspeed improves penetration into the headwind AND by increasing airspeed, we descend through the wind gradient and decrease the headwind component. Early identification of being (or getting) low is essential. You can't wait until you're about to hit the trees to push the nose down.
3. If you're over a smooth surface, you may be able to extend your touchdown point by descending into ground effect before you have used up all of your potential (aititude) energy. To use ground effect, descend to just above the ground while still at a speed higher than the normal flare airspeed. Then dissipate that speed in the lower drag situation, extending the touchdodwn point. Ground effect MAY be a tactic BUT only if the PIC KNOWS that the surface below is completely free of any obstacles - wires, posts, shrubbery, trees, fences, etc. However, if you hit anything in the meantime it will be with increased energy. Remember the kinetic energy is a function of the *square* of the velocity. If you're 20% faster than normal

(e.g., 60 instead of 50) the glider carries almost 45% more kinetic energy. Think of the use of ground effect in these scenarios as the “Last Refuge Of A Scoundrel” - who has thrown away every previous opportunity and tactic to maintain a safe glide angle to his aiming point. As such, and because it is limited to very flat, obstacle-free terrain, We rate it as 2.5 rather than three.

Being too high:

The risk of being too high is overshooting the intended area of landing and possibly a collision at the far end of the field. The far-end collision will likely be at a lower speed (unless you’re still airborne) and therefore with a lot less energy. If you half your speed, you have one-quarter the energy!

The number of mitigations for a high approach are much greater.

1. Airbrakes: Full - the most obvious and easiest solution, and often all that’s required.

2. Slip: Using the side profile of the glider adds drag and increases the descent rate. This is especially effective in gliders with large side profiles like a 2-33. If the PIC is proficient in slipping turns, they can be employed during the S-turns to increase the descent rate even further - to a rate of thousands (!) of feet per minute — literally. A slipping turn is a safe maneuver (don’t confuse with a skidding turn, which is not safe.)

3. With airbrakes deployed, increase airspeed: A 20 knot increase from 50 to 70 is a 40% increase in airspeed. Since drag is a function of the square of the speed, 1.4 squared is 2 doubling the drag/descent power of the airbrakes. Additionally, the increased airspeed during any S-turn maneuvers guarantees a safe margin above inadvertent stall.

4. The shortest distance between two points is a straight line. So, do NOT fly a straight line to the aiming point when too high on final approach! If you’re still on base leg, don’t cut the corner to final. S-turns (rather than flying a straight line to the aiming point) yield the benefit of additional TIME to solve the problem of excess height energy. S-turns allow the PIC to ALWAYS have the aiming point in view, allowing constant assessment of gliding angle changes, which will occur very rapidly as the glider sink rate in these maneuvers is tremendous. Extending the flight path with S-turns buys many seconds of extra TIME for the high-drag configuration of the glider to work its magic. TIME for the PIC to settle down and safely solve the problem of excess height energy.

5. Fly S-turns with a 45° bank angle. This incurs a 1.4 G load and increases the descent rate by 68%. Compare this to only a 24% increase with a 30° bank turn. In addition, the use of large control surface deflections (specifically, ailerons and rudder) to induce rapid changes of bank angle at 70 knots or more causes additional drag-control drag and the descent rate increases as a result. While many gliders have powerful airbrakes that would negate the need for S-turns, some do not (I'm looking at you: Libelle and Standard Cirrus).

All of these techniques should be trained and practiced at a safe altitude first(with a CFIG) before putting them to work on final approach.

These scenarios put your knowledge of aerodynamics and physics principles to work for you. Here, speed to fly, sink rate increase in a turn, and the effects of speed on kinetic energy and drag have been employed with real-life strategies to recover from an abnormal approach. These are great examples of applying this book knowledge to everyday flying actions that every pilot should fully understand.

Exactly how you apply these techniques will depend on the situation and the glider. Some gliders have very effective speed brakes - which may be all you need, others not so much. Some may have more effective slip characteristics than others. In both scenarios, early detection is key to avoiding the need for drastic measures and a narrowing margin of safety.