Theory Unit # 5

Circuits and Landing

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Aims

- For a safe landing we must: -
  - Break off the flight – terminate soaring
  - Have a suitable landing area and pattern
  - Configure the aircraft for landing
  - Set up a final approach path with a safe margin over obstacles.
- The purpose of the circuit is to arrive at the final turn in the right place, at a safe height (at least 300ft AGL) and speed, and with safe alternatives always available.
- At an airfield it has the further purpose of setting up an orderly flow of traffic.

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Units covered by this Theory Lesson

- Unit 15 – Break-off and Circuit Planning
- Unit 16 – Circuit Joining and Execution
- Unit 17 – Stabilised Approach and Landing

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Break off point

- At some point, you must decide that it is time to land and move to your selected landing area.
- This may be because
  - You have run out of lift and are getting low.
  - Changing weather conditions.
  - Or it is time to return the glider for the next pilot.
- This is an important decision and confirms that you are a landing pilot and no longer a soaring pilot.
- You should have identified a suitable landing area – an airfield or a suitable field/paddock, which is within easy reach of your current position.

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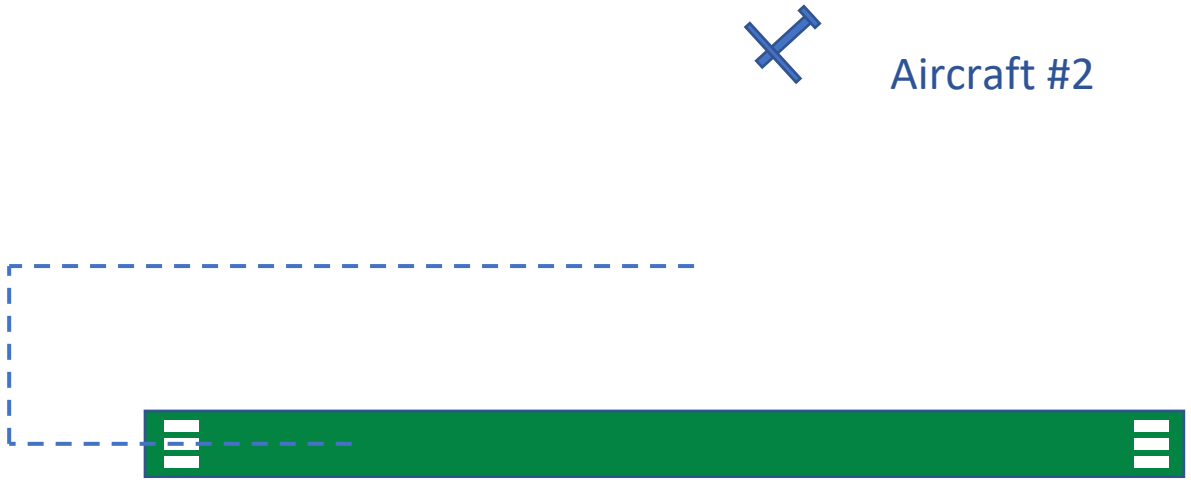
Break-off

Break-off height will be different depending on how far away from the circuit you are.

Break off from soaring flight with enough height to return safely to the chosen landing area




Aircraft #1

Aircraft #1 will need to break off the flight higher and sooner than Aircraft #2, in order to reach the circuit.

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Situational awareness

- When deciding to break-off the flight you must have identified a suitable landing area within easy reach from your current height and location.
- Failure to make this decision with sufficient time and height to plan and conduct a circuit to land will lead to serious difficulties, rushed planning and possible accidents.
- Ensure you can return to the landing area with sufficient height to join circuit on arrival.
- Identify any traffic that may conflict with your track to the landing area and maintain clearance from this traffic. [Consider a radio call that may alert this traffic of your plans].

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Situational awareness

- Assess wind, sun, traffic and other factors early so you can decide on your landing area and circuit pattern and give yourself plenty of time to plan the circuit.
- Identify a clear landing area on the airfield or suitable alternate if insufficient height to reach the airfield.
- Identify an appropriate circuit direction and circuit joining area in accordance with airfield procedures, weather conditions and aircraft performance.
- We always land into wind unless the circumstances require another option to be taken. (*such as sun glare, or other traffic*)
- Consider options for joining a circuit with other traffic.

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Setting up for the landing

Setting the Speed

- At the break-off point, determine Approach speed (1.5Vs + ½ wind speed)
- Establish safe speed near the ground (1.5Vs) below 1000ft
- You should Set approach speed from the break-off point, but at the latest, before the pre landing checks, (which is early on the downwind leg).
- The Downwind leg must be flown close enough to the runway so that you can clearly see any obstructions on the landing area, and far enough away to give you enough room for a base leg.
  - Look out the side of the glider at the runway and determine how steep it is down to the landing point.
  - If the angle is too steep then you are too close and you will not be able to adjust your glide on base leg. To correct for this, turn the glider away from the strip (20-30 degrees) for a few seconds, then resume a track parallel to the strip and re-assess.
  - If the angle is too flat then you may not be able to get back to the runway if you hit sink. To correct for this, turn towards the runway for a few seconds and resume a parallel track.
- Maintain your attitude through reference to the horizon (1.5Vs + ½ wind speed).
- Maintain your track parallel to the runway.

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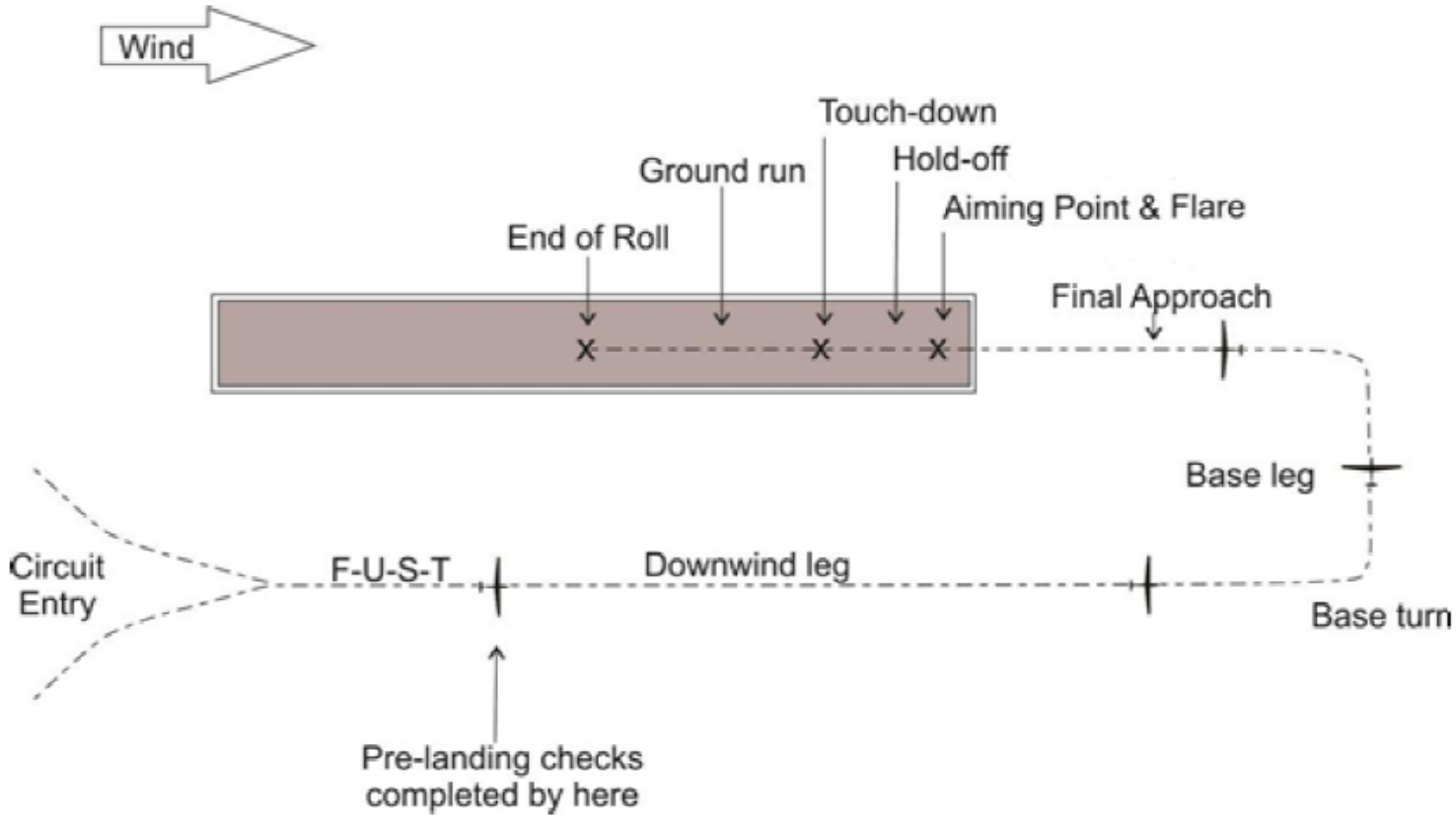
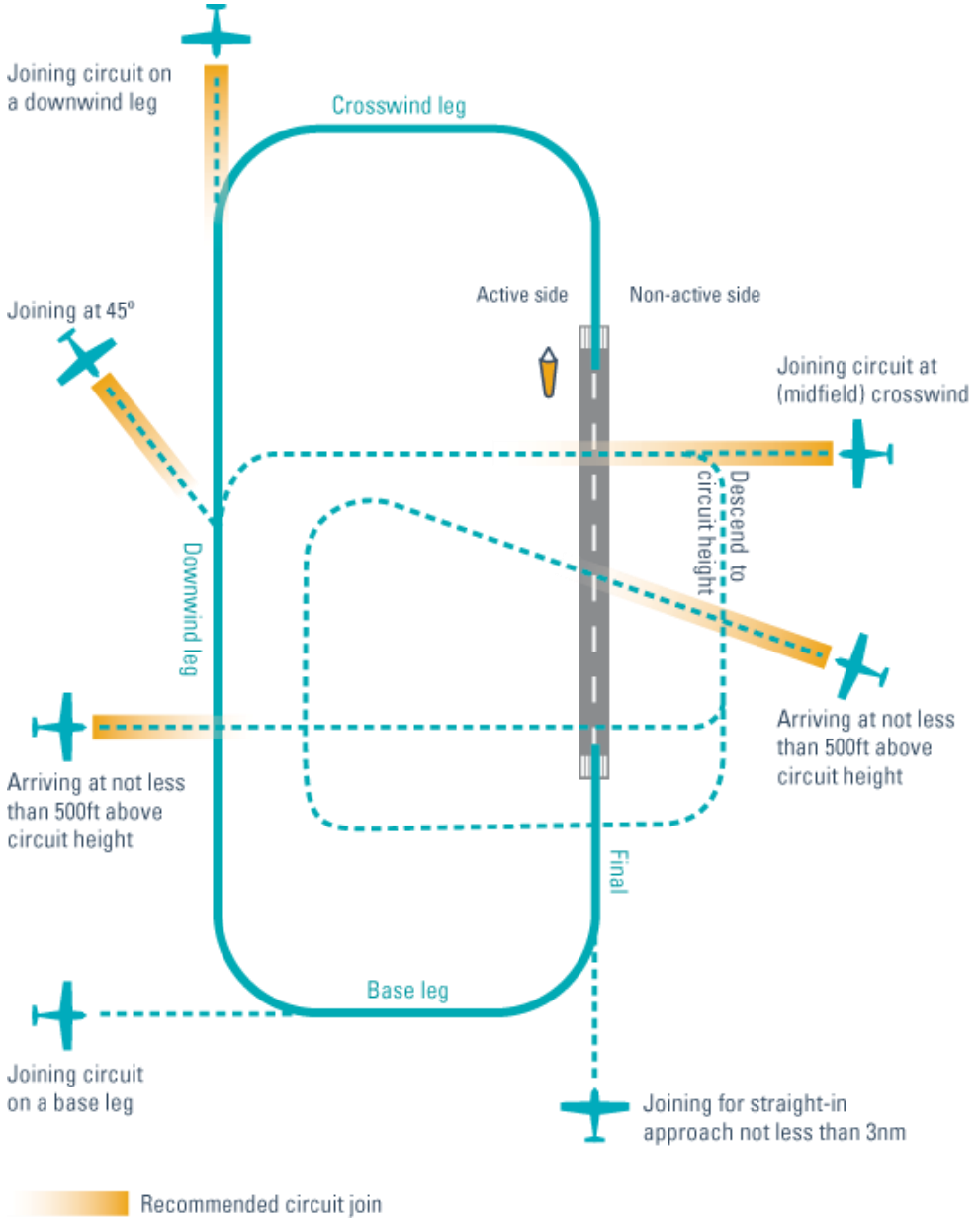
The circuit

- A circuit is flown in such a way that the glider is always within easy reach of the landing field and has clear visibility of the landing area.
- Most airfields have set directions for the circuit, for a range of local restrictions, such as noise over town, conflicting power traffic. You need to become experienced at left hand and right hand circuits.
- The diagram below shows a Left hand circuit, where all turns are to the Left.



Circuit Arrivals (CASA CAAP166)

- Circuits may be joined from a number of directions
- Gliders have a continuous sink rate and the preferred circuit joining direction is from either downwind or crosswind.
- These options provide for the best circuit planning



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Planning

- Identify the landing area, circuit pattern and circuit joining area
- Assess the wind strength and direction
- Transit to the Circuit Joining Area
- Maintain situational awareness, and targeted lookout to fit with other traffic and ensure sufficient height for the circuit on arrival.
- Configure the aircraft for Landing
  - Straps
  - Water ballast dumped in gliders so equipped.
  - Engine configuration set.
  - Radio set and positioned
  - **FUST** - Flaps set if applicable, Undercarriage lowered, Speed for circuit, Trim
  - Adopt safe speed at 1000 AGL (above ground level) – 1.5V_s (Stall)
- Re-assess

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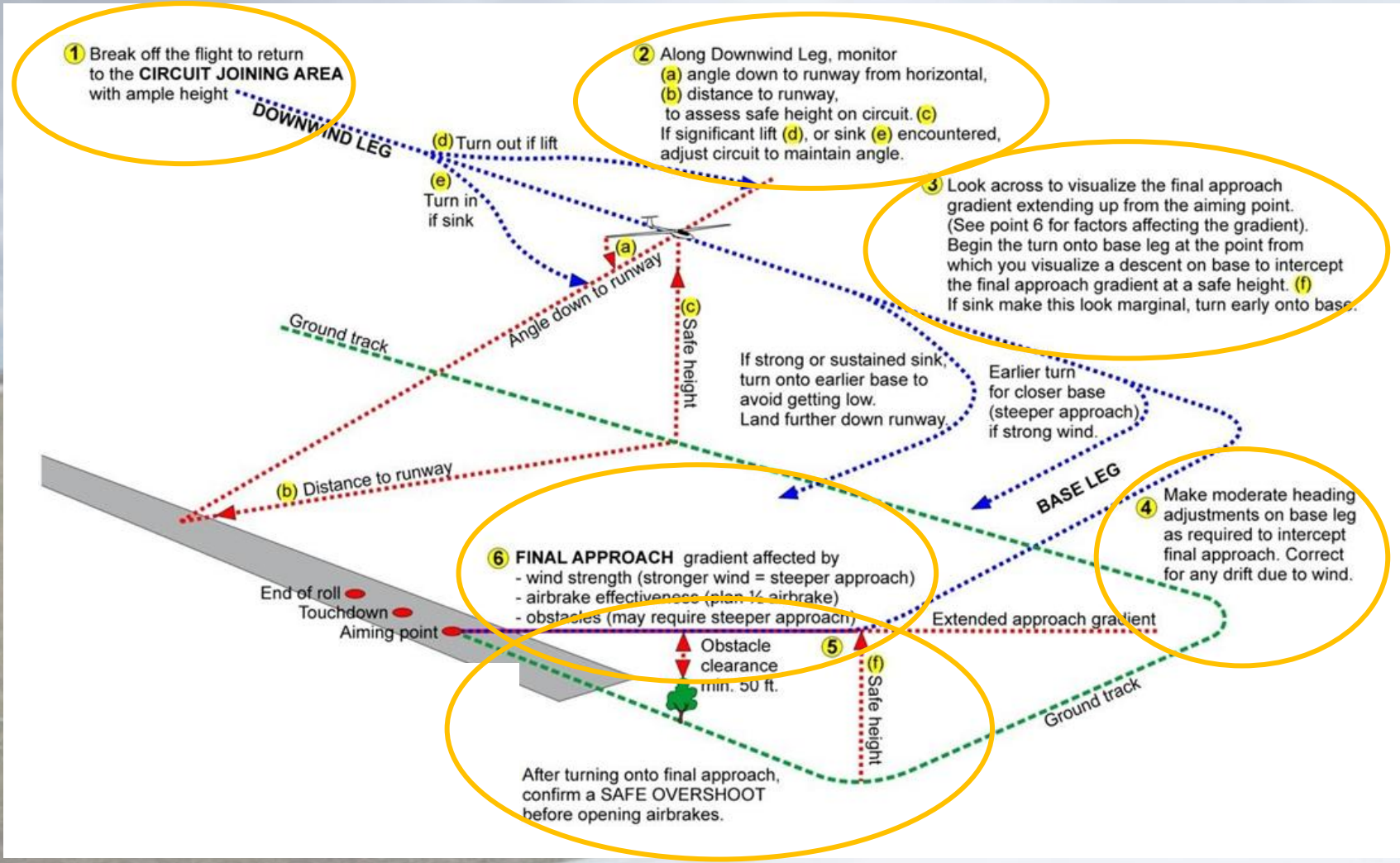
Normal Circuit starting on Downwind



1.Break off the flight

2. Downwind Leg – monitor and adjust for lift and sink; Set circuit speed for 1.5Vs plus half wind speed. Radio Call. FUST check

3. Visualise the final approach

4. Base leg – monitor and adjust to intercept the final approach

5. Turn onto final approach with safe height (300’ minimum)

6. Final approach

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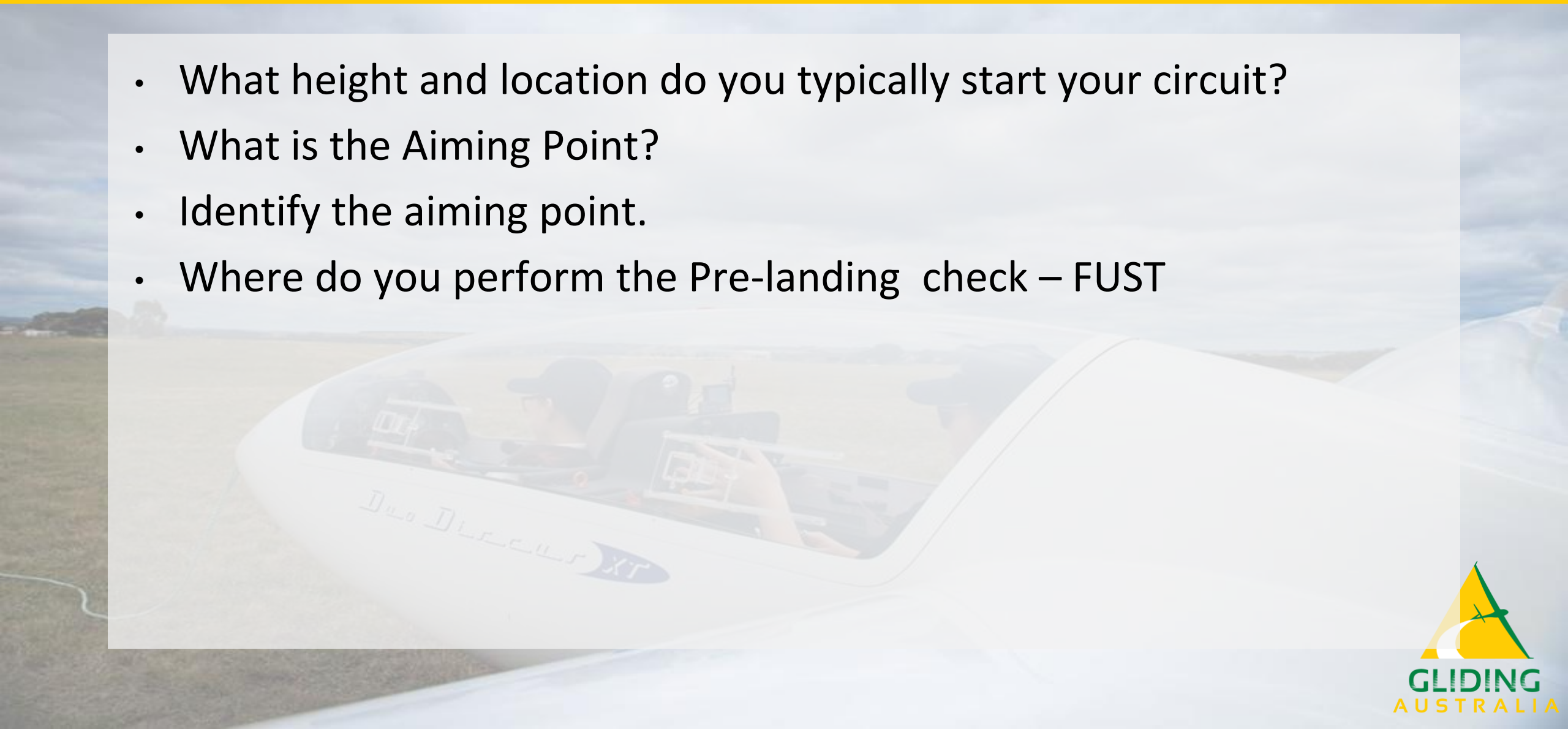
Normal Circuit starting on Downwind

- What height and location do you typically start your circuit?
- What is the Aiming Point?
- Identify the aiming point.
- Where do you perform the Pre-landing check – FUST



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Identify the aiming point

- Select a suitable landing area
- Must be long enough, Preferably into wind
- What obstacles are there?
- Where do you want to stop the glider?
- Step back through the ground roll, touch down and flare and thereby identify where the aiming point should be.

- Your decision re angle to the field and where to turn base etc are all relative to your selected aiming point.

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Threats and Errors

- You may need to make changes if you encounter changed conditions
  - What would you change in the event of traffic or wind changes?
  - If you cannot reach the joining area on the correct side of the runway, what are your options?
  - What action would be taken if the chosen landing area is no longer reachable?
  - What errors (by you or other pilots) might you encounter?

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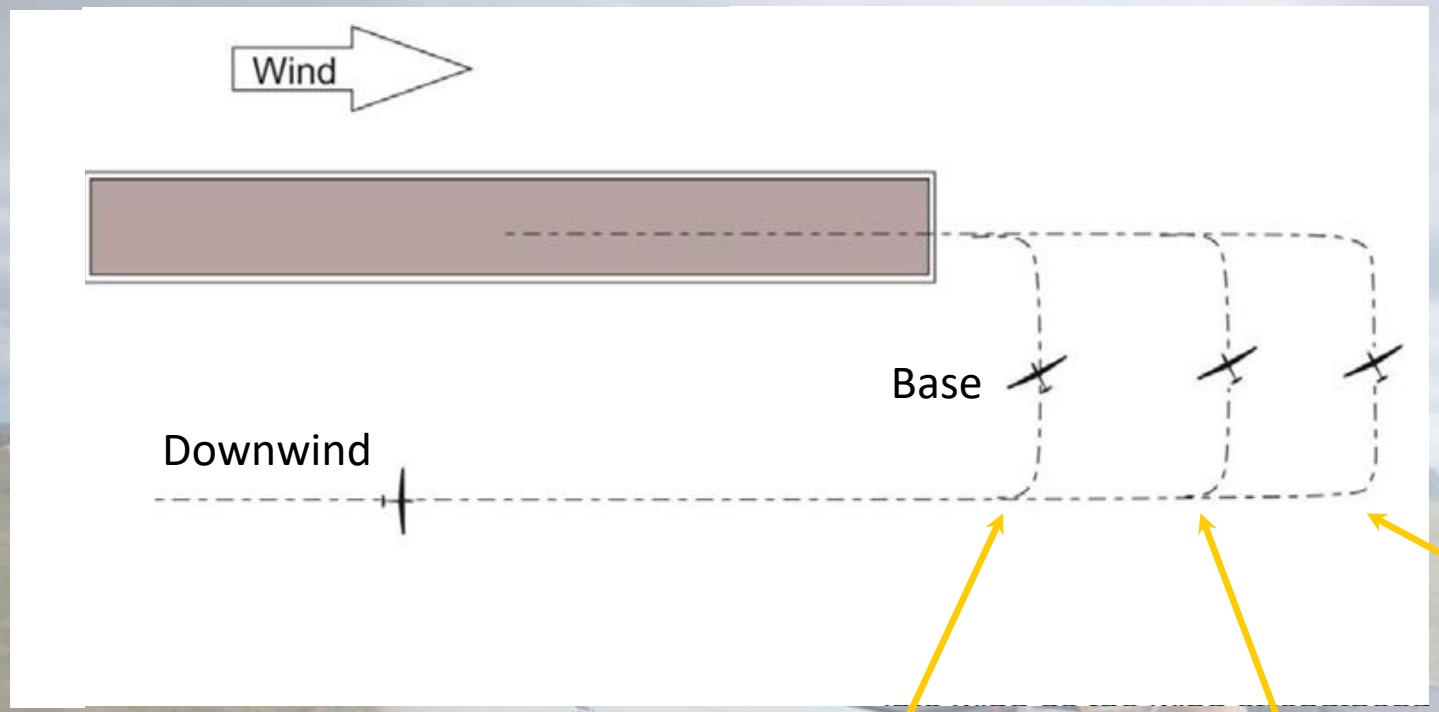
Effect of Strong Winds



Always turn base to ensure the glider can make a stable approach using airbrake

Normal circuit – no wind

Moderate wind – turn base leg earlier

Strong wind – turn base leg much earlier

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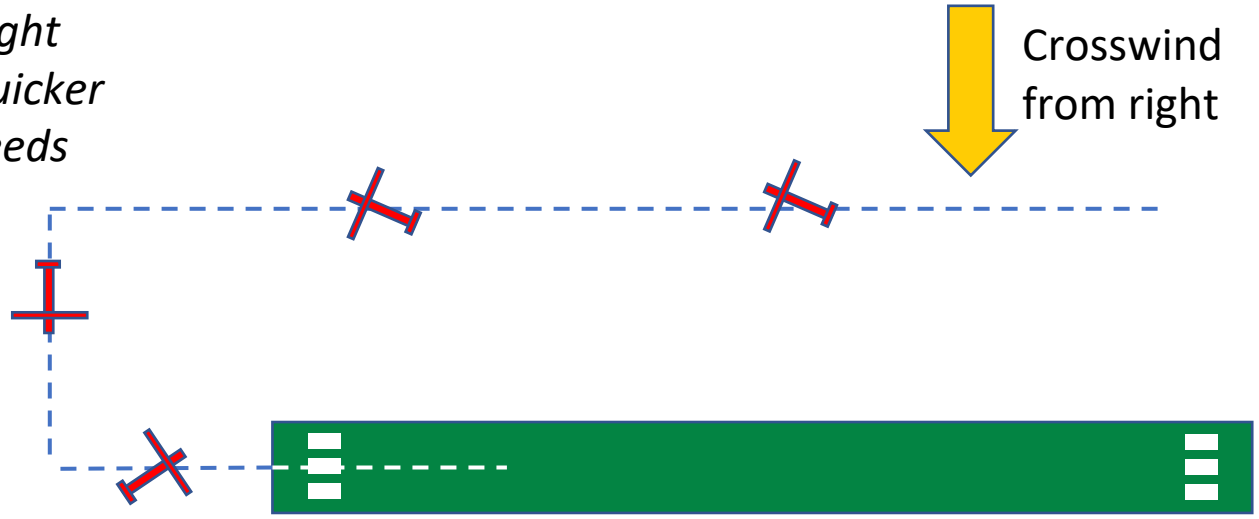
Effect of Crosswinds on circuits

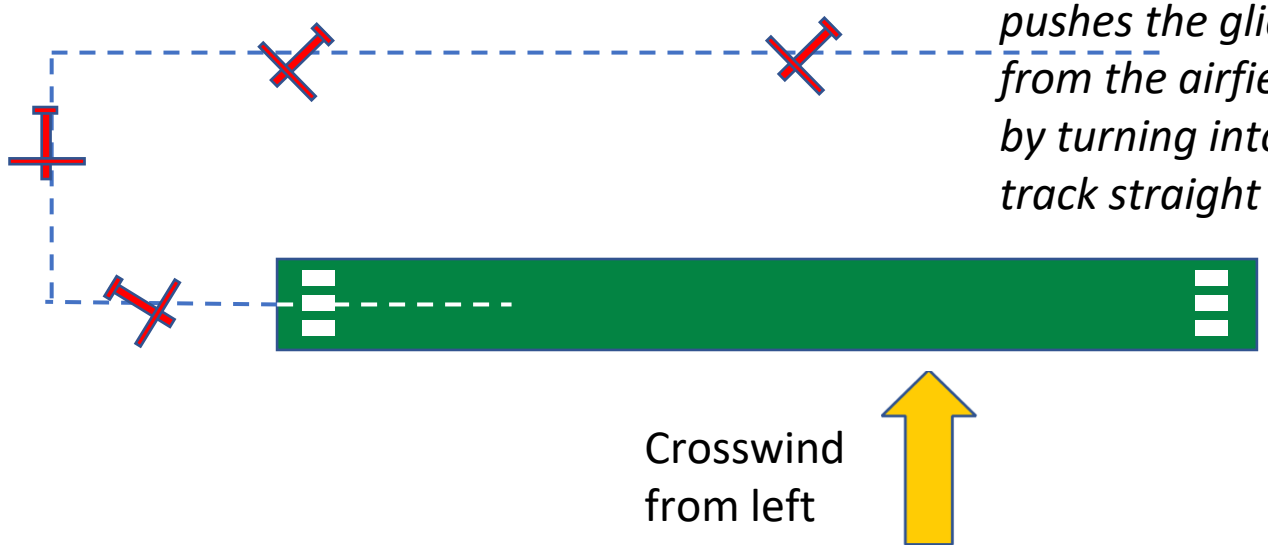
Crosswind from the right makes the base leg quicker and turn onto final needs to be made earlier



Crosswind from the right pushes the glider towards the airfield and can cramp the circuit; correct by turning into the wind to track straight

Which of these options is best to choose, if possible?

Crosswind from the left makes the base leg slower and turn onto final needs to be made later



Crosswind from the left pushes the glider away from the airfield; correct by turning into the wind to track straight

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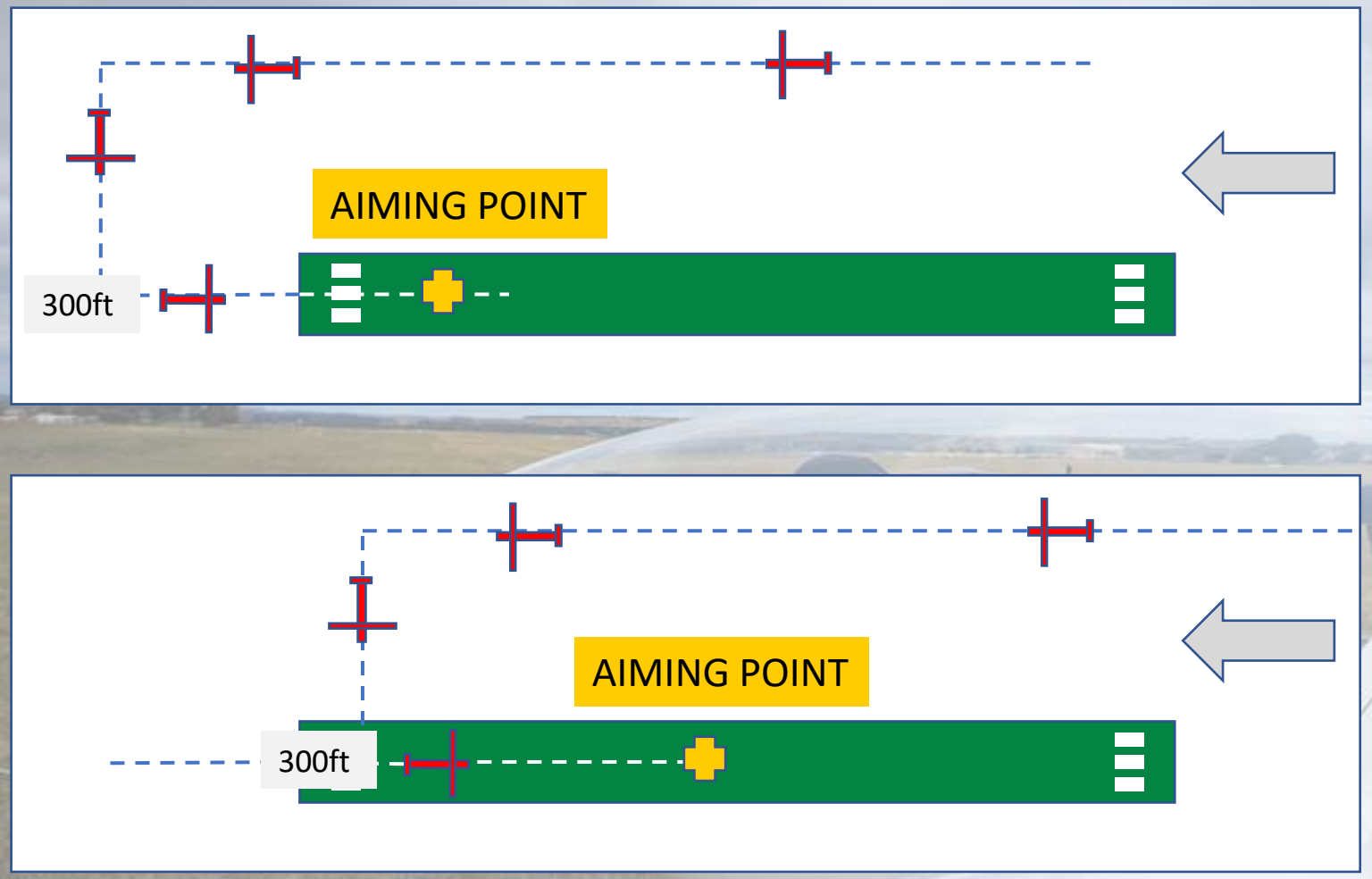
Modifying the Circuit



A modified Circuit may be required if:

- encountering significant sink in the circuit, or
- Inadvertently too low to make a full circuit.

If too low,

- Identify early!
- Shift the aiming point further into the landing area, and
- Ensure turn onto final is at least 300ft

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BASE LEG

- When you have completed the turn onto base, you should be able to confirm that the interception of the final approach path will take place as planned and will result in a straight run-in down the "ramp" to touch-down with plenty of time to make fine adjustments.
- The final approach leg must be sufficiently long to allow time on final to settle and assess approach path prior to using airbrakes to establish a stabilised approach.
- Ensure turn onto base leg and onto final is a coordinated (30-40° bank) turn – airbrakes should not be used – but if extended prior to entering the turn do not extend further during the turn.
- Maintain the approach airspeed and monitor situational awareness.
- Targeted scan for traffic coming head-on from an opposite circuit or for traffic approaching from the side on long final.
- Continue to monitor the approach path and landing area – assess the ability to land or determine changes required.
- Adjust commencement of the final approach turn for head/tail wind component on base leg. If in a tail wind start turn earlier.
- During the Base leg locate and put your left hand on the Airbrake lever.
- If height is excessive airbrakes can be used, provided they are opened before the turn, ensure airspeed is maintained. Ideally we want to be a minimum of 300’ AGL when you have completed the turn onto Final.

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Final approach and Landing

- Aim: To provide a safe stabilised approach and landing, for a wide range of environmental conditions.

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The Final Turn from Base to Approach

- The final turn should be a normal (30-40°) banked turn, similar to the one onto the base leg at the selected safe approach speed, having regard to the local conditions.
- Upon completing the turn and with the wings level, line the glider up with the required landing path into the landing area and confirm the landing area is clear.
- The turn should be initiated early enough to avoid overshooting the centreline of the intended approach.
- Turning too late is a common student error, which often induces a steep final turn and misalignment with the landing area centreline.
- Poor landings, or landings causing damage or injury, are much more likely to result if the final turn is executed too late, too close to the ground or with poor energy management, all of which make a stabilised approach and controlled landing much more difficult.

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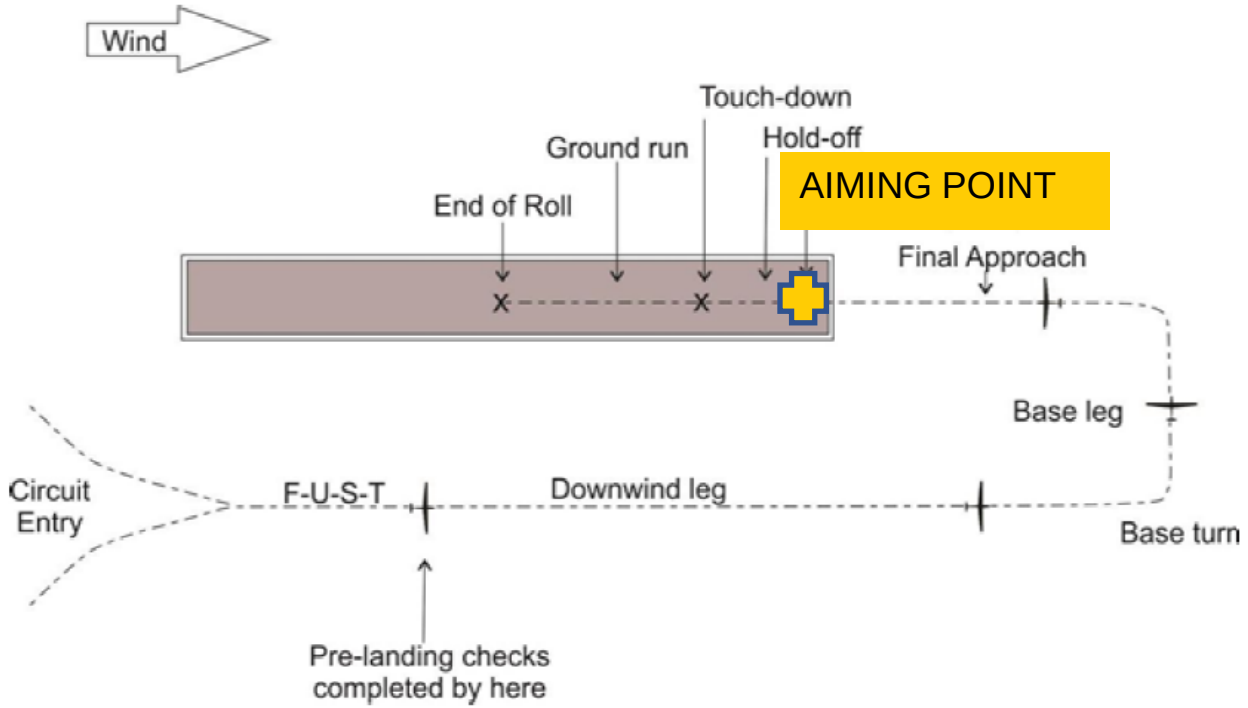
Stabilised Approach and Landing



A stabilised approach:

- will result in a good landing
- allows time to assess the conditions on final

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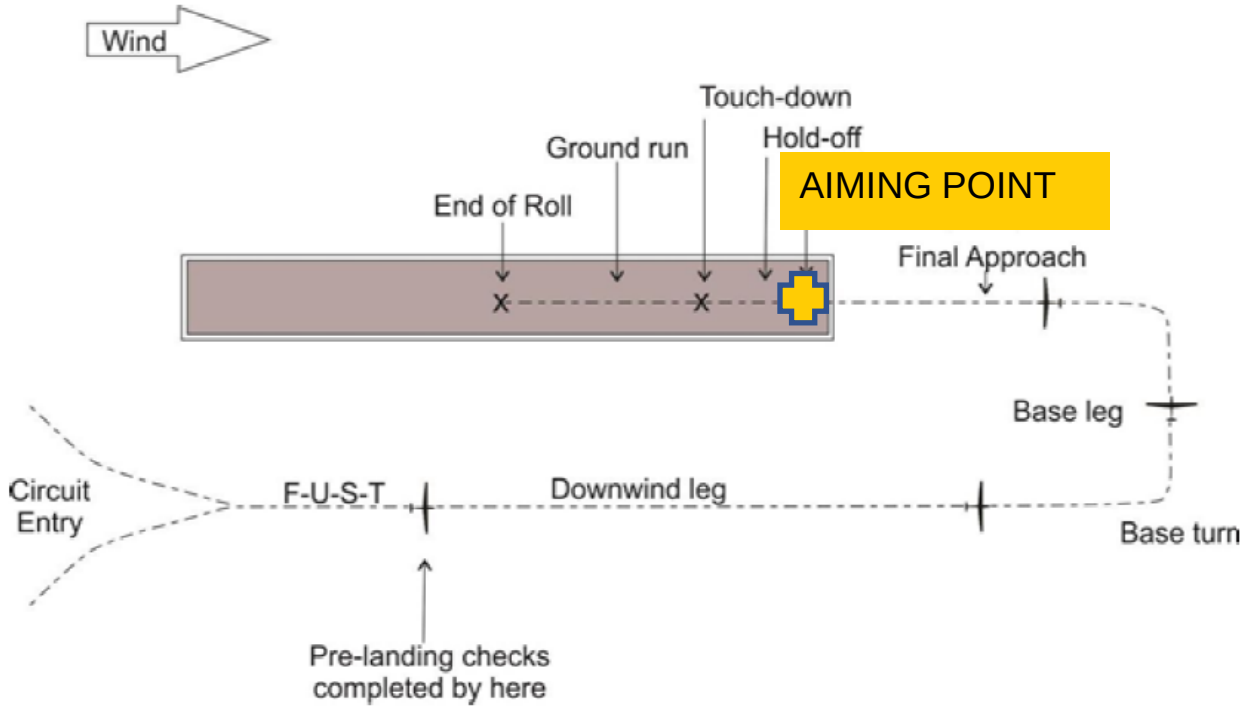
Aiming Point



The Aiming point

- is an **approach aid**
- is the end point of the final approach
- is the point where the glider hits the ground if we don't bother to round-out
- will appear stationary when the glider is on a stable approach

- On turning onto final leg, establish OVERSHOOT of the aiming point, then use airbrake to obtain the glide slope to the aiming point.

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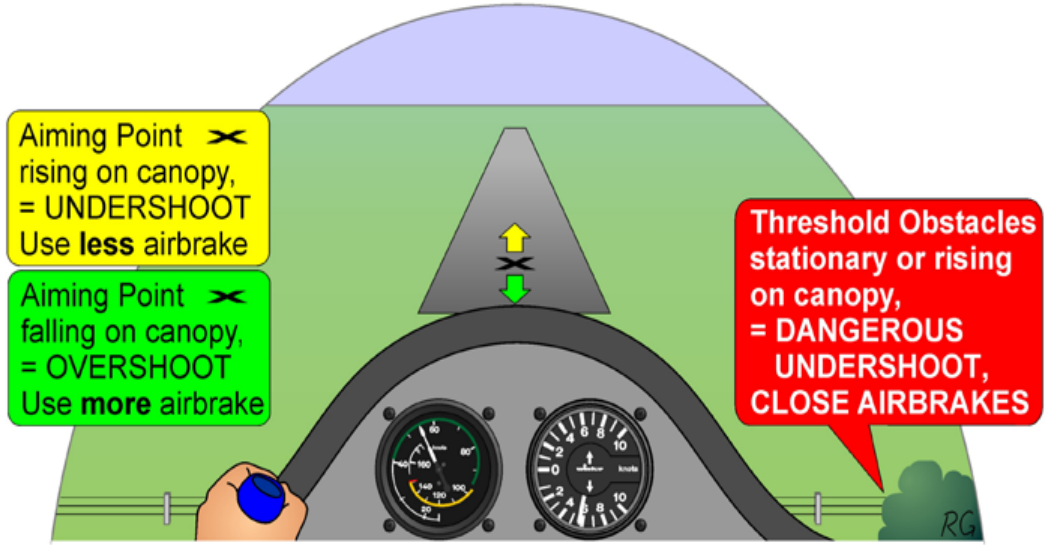
Speed, Direction, Descent

On Final, continually monitor

- Speed,
- Direction,
- Descent

Overshoot and Undershoot

- **Undershoot** is when the glider is BELOW the final approach path
- The aiming point moves upwards
- Reducing the airbrakes **flattens** the approach path and restores the aiming point



- **Overshoot** is when the glider is ABOVE the final approach path
- The aiming point moves downwards
- Extending the airbrakes **steepens** the approach path and restores the aiming point

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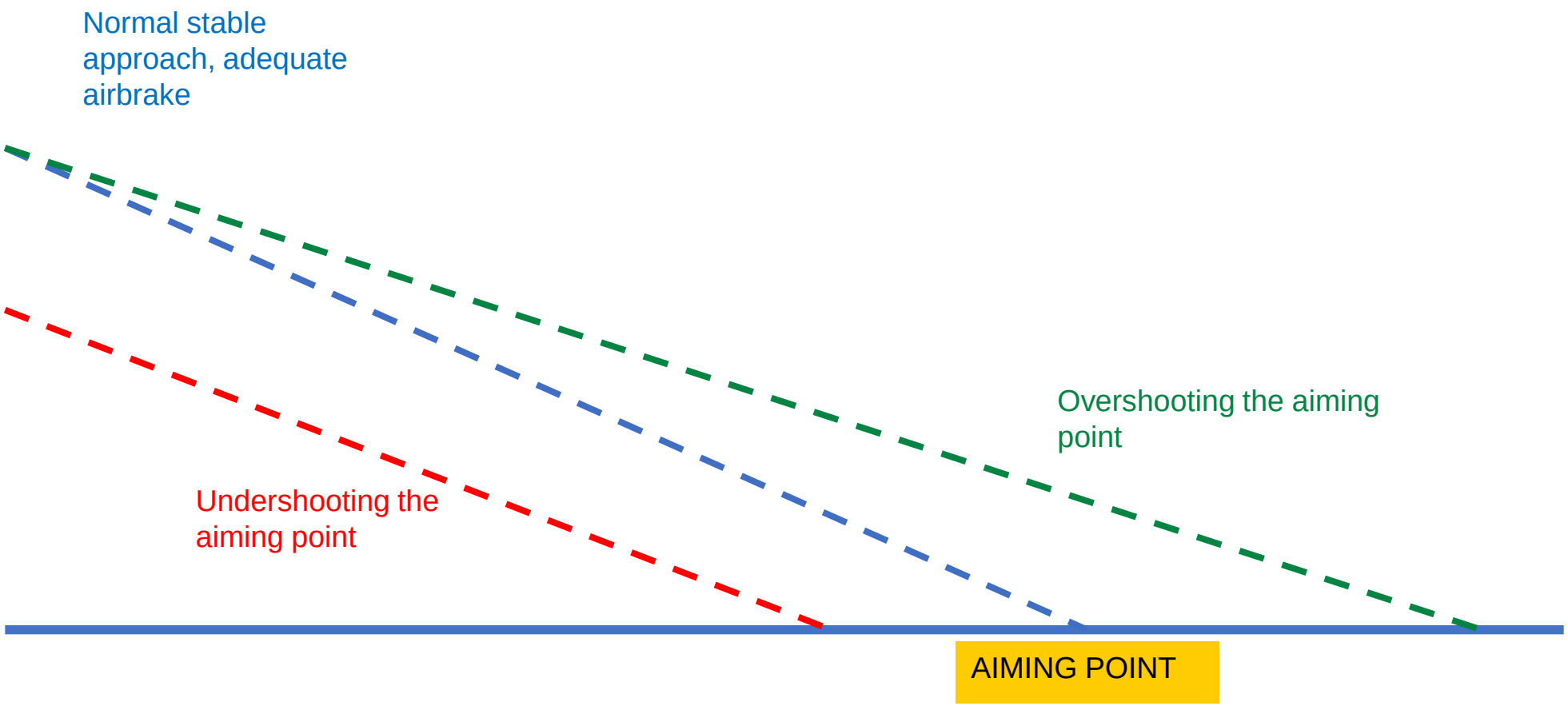
Glide Slope



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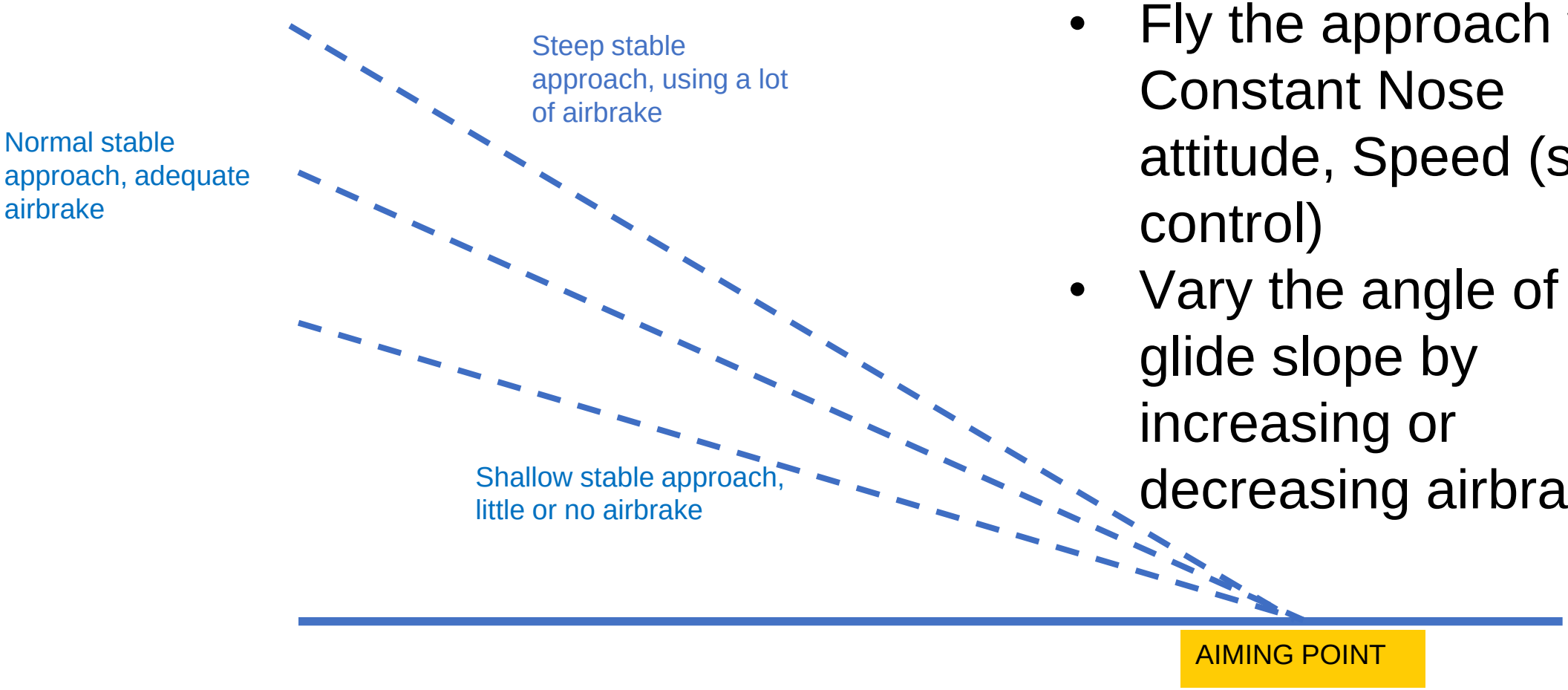
Glide Slope



- Fly the approach with Constant Nose attitude, Speed (stick control)
- Vary the angle of the glide slope by increasing or decreasing airbrake

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Wind Gradient on Approach

On approach, the glider has IAS of 55kts and is flying into a 20kt headwind

20kts wind

As it descends, the headwind drops to 15kts. Glider has IAS of 55kts and 5kts of airflow over the wings is lost and IAS drops to 50kts.

15kts wind

If uncorrected, the glider has IAS of 50kts and then descents to a level where the headwind is now 5kts. It loses another 10kts of airflow over the wings and IAS drops to 40kts

5kts wind

When encountering wind gradient,

- increase the speed and
- Reduce/Close the brakes.

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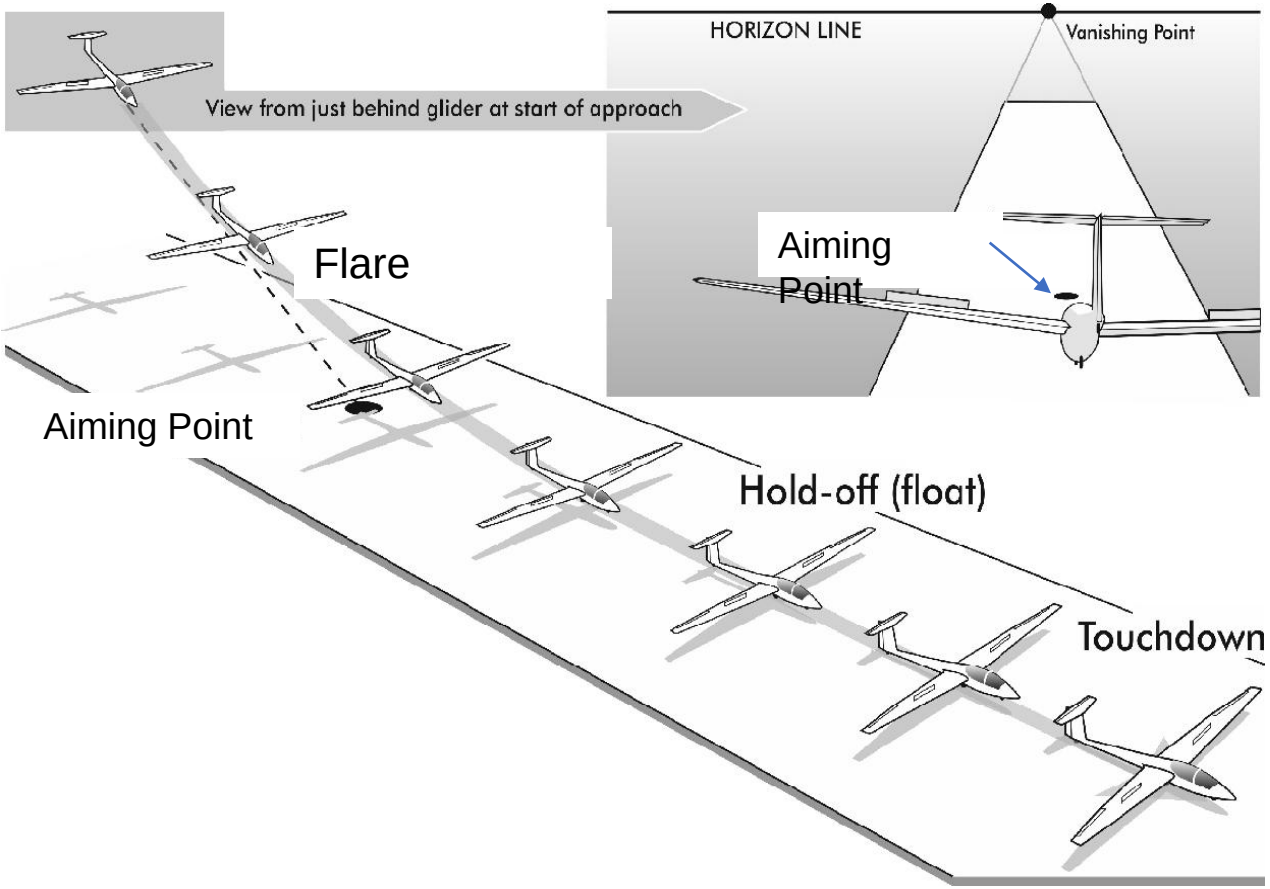
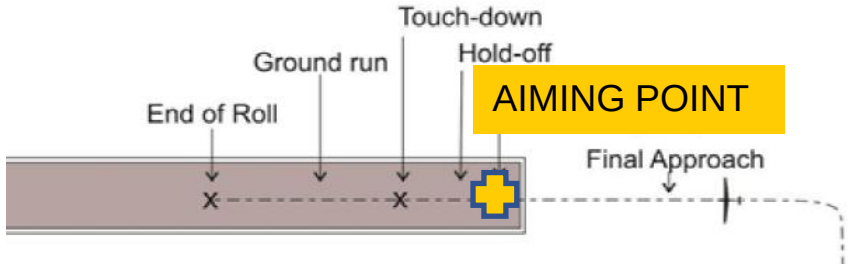
Landing - Flare, Hold-off and Ground Roll



Landing is the transition from Stabilised approach to

- Flare -to
- Hold-off -to
- Touchdown and



Acknowledgement: BGA Instructors Manual 2017

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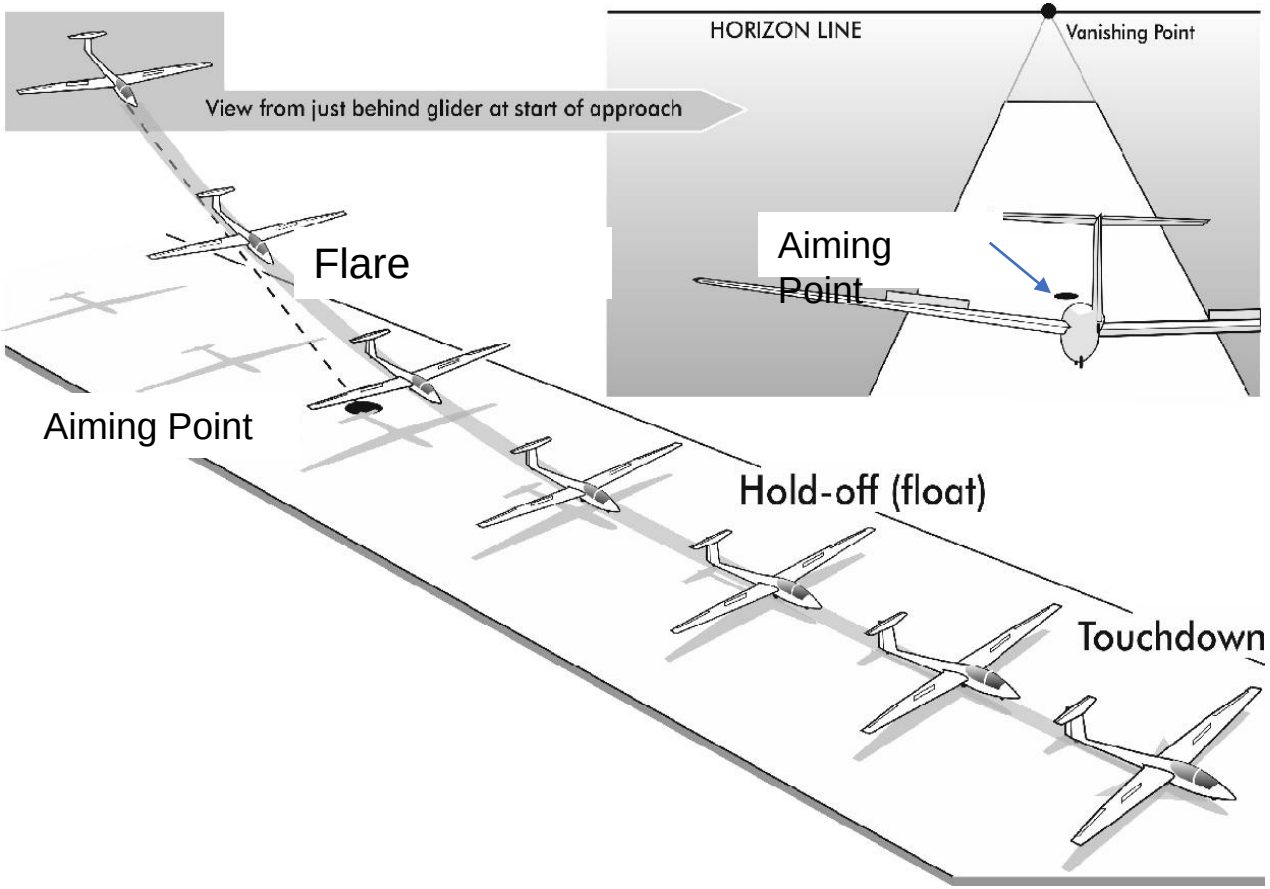
Flare (Roundout)



- *Flare* changes the glider from a descending attitude at a constant speed to a horizontal attitude with decreasing speed
- It puts the glider into the two-point attitude.
- The Point of flare is variously described as "*the height of an elephant*", *the height of a single story building*" etc

Acknowledgement: BGA Instructors Manual 2017

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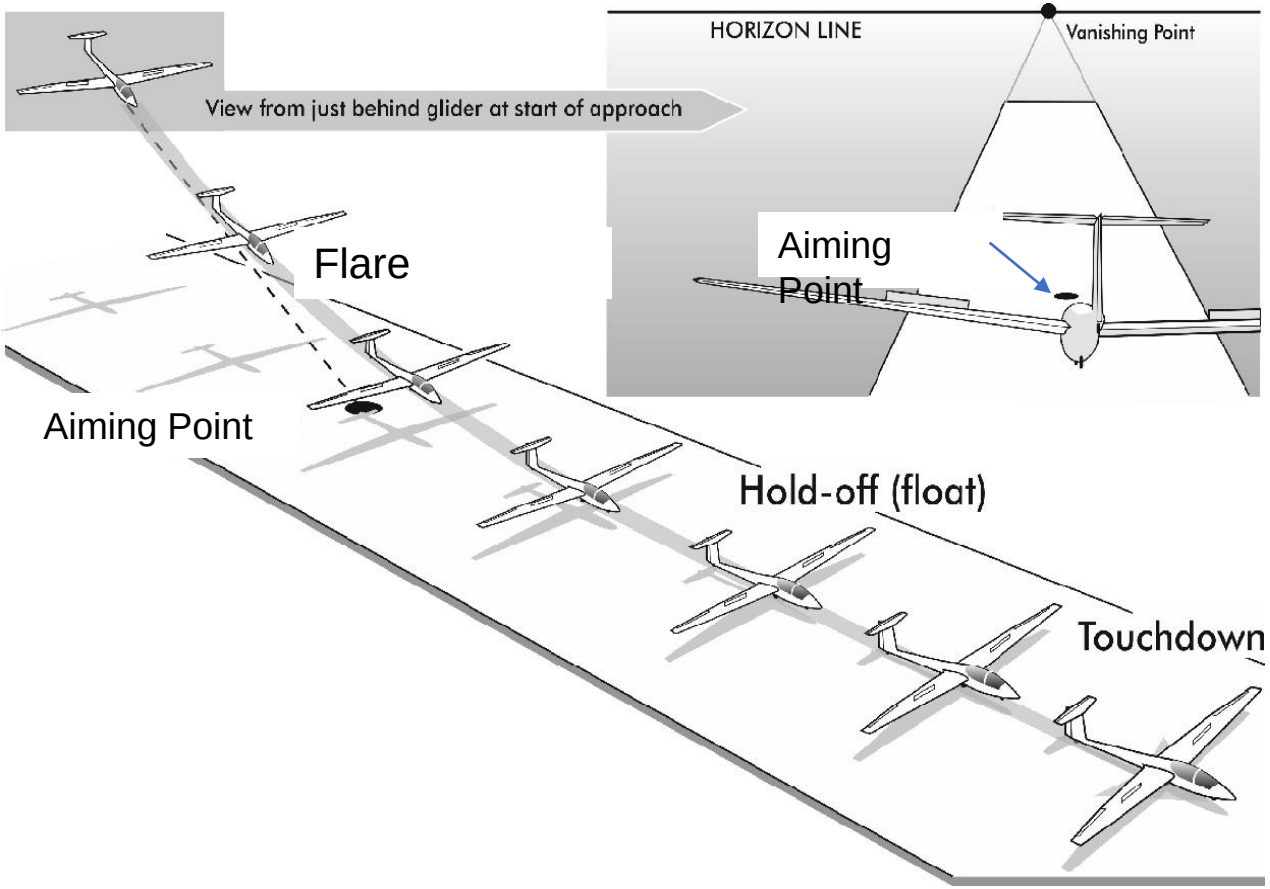
Hold-off and Touchdown



- The flare puts the glider in the two-point landing attitude,
- gradually increase the back-pressure on the stick to hold off the ground
- Transfer gaze to the end of the landing area
- The glider should touch down at minimum energy.

Acknowledgement: BGA Instructors Manual 2017

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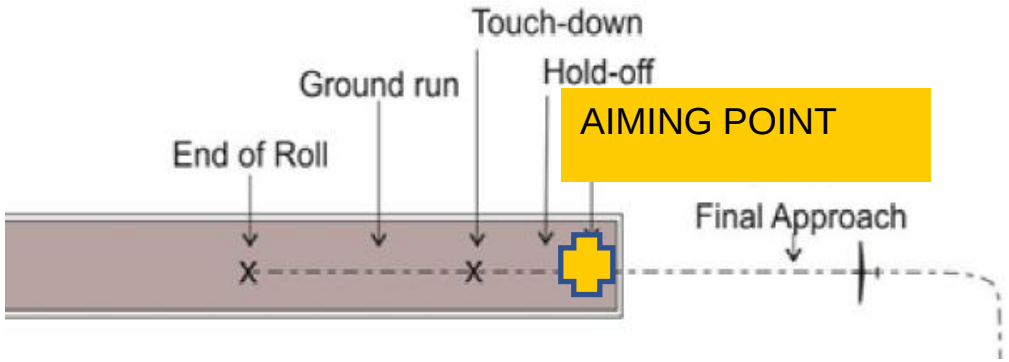
Ground run and End of Roll



- Continue to control the glider until it is fully stopped
- Use rudder to steer and ailerons to keep wings level
- Increasing input on controls (rudder, aileron) is required as the glider slows

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Review

Questions