



Operational Safety Bulletin

No. 01/19

AVOIDING APPROACH & LANDING ACCIDENTS DURING TRAINING

This Bulletin discusses landing accidents involving misapplication of controls by the student during approach and landing, and provides some guidance on how to train against these accidents.

Background

Heavy landing accidents, and accidents involving an apparent loss of control during final approach, have been too frequent since gliding began. Many of these involved two-seat aircraft on training flights involving students with a relatively low time and/or minimal launch experience level being directed or monitored through the landing by an instructor. It is clear that many of these accidents involved an unexpected and inappropriate control input by the student, usually involving the elevator control, leading to either an abrupt nose down pitch and dive, or a nose up pitch and stall, from which the instructor was unable to recover sufficiently or not at all.

A recent double fatality accident involved a very experienced instructor training a student on their eighth flight; who was probably being directed by the instructor through the final approach and landing. At a height of between 30 and 50 feet on a normal final approach, the aircraft was observed to increase the airbrake setting and simultaneously dive into the ground at a steep angle in excess of 60 degrees. Injuries suggest the instructor had his left hand on the dive brake and right-hand on the control column, and that the student had his right hand on the control column at impact but the exact control inputs are open to conjecture. For whatever reason however, it is clear that the student must have pushed forward quite vigorously with his hand on the control column and the instructor was unable to respond to recover from the effect of the inappropriate control input due to limited reaction time.

Two further incidents since then were alarmingly similar. These involved students who input large and inappropriate elevator control movements with one hand while also manipulating the airbrake control with the other hand. These may have resulted from misguided attempts to control airspeed as the airbrake setting was adjusted, or may have resulted from some mental confusion about what the two hands were doing with the two different control inputs on the control column and the airbrake lever, or some other confused/aberrant reflexes. In these two cases the incident occurred at sufficient height for the instructor to respond, although one of the aircraft sustained serious damage.

What action should we be taking to eliminate these accidents?

Firstly, it must be quite clear who is flying the glider at any time. When you take control, say clearly *"I have control"* (or *"my aircraft"*) and start flying only when you have heard the student say *"You have control"* (or *"your aircraft"*). Similarly, when you hand back *"You have control"* *"I have control"*, and then take your hands and feet off the controls. Don't abbreviate the words to *"I have"*. The only possible exception to *"I have control"*, *"You have control"* etc. might be in a sudden emergency when you can't afford to waste time saying anything before doing it! But still say the words anyway — the student will be more likely to let go!

Prompting

There are several types/stages of prompt ranging from the indirect question or suggestion, such as *"Where are you going to land?"* through the direct *"Move left to miss the other glider"*, to an intervention *"I have control!"* Unless things are going badly wrong, start with the indirect prompt — this is an invitation, if you like, to the student to assess a situation and make a suitable decision. The prompt does not tell the student exactly what to do. If this produces no response then the next prompt will be in the form of a direction *"Do this"* — in effect, a piece of advice on what to do next. Whilst the actual decision/judgement has been taken away from the student (you are asking them to do something specific) they are still flying the glider. The final stage in prompting is, obviously, *"I have control"*, where you intervene to make the decisions/judgements and do the flying. Students usually learn best when they are making their own decisions, and getting them wrong, so you must think carefully about when you should say something, and what it should be. Don't wait too long. If the situation is getting out of hand take control in plenty of time. Early intervention is needed close to the ground as time is short.

Demonstration

Experienced instructors are agreed that students must not be progressed through their training into being directed by the instructor through the final approach and landing, until they have demonstrated a high level of control co-ordination during upper air work training sequences. Before being allowed onto the controls at low level (i.e. circuit height), the student will be benefitting from instructor demonstrations with the student following on the controls. Remember the *demonstrate-direct-monitor* training sequence and be clear where the student is on this sequence once landing training is to be introduced. Do not 'over progress' the student through this phase!

Above circuit altitude demonstrate the primary effect of elevator at lower airspeed to show stick movement, and also at approach speed so that the student appreciates the reduced stick movement and increased effectiveness of the elevator. It is important the student understands the range of stick movement at various speeds before handling the aircraft close to the ground (i.e. below the spin recovery height for the aircraft). This emphasises a need to ensure that the student has gained the fine motor skills to manipulate the controls appropriately, particularly the elevator, and the student appreciates the relatively small elevator control inputs that are required at approach speeds.

When conducting an actual approach, any tendency for the student to make frequent adjustments to the airbrake setting must be discouraged, especially if it is not possible to detect the effect of one change before the next one is made. Failure to maintain a near-constant setting may be due to lack of familiarity with the forces and changes involved. A useful exercise to overcome this problem is to agree before take-off that the student may move the airbrake position only once on the approach. In practice the instructor may have to allow further movements, but the exercise will discourage frequent adjustments and help build confidence.

The practice of closing airbrakes in the final stages of the approach must be discouraged except when the speed is decaying too quickly to allow safe completion of the round-out and the glider is too close to the ground for the pilot to be able to lower the nose; or where lowering the nose is not increasing the speed fast enough.

Threshold of Intervention and Defensive posture

The instructor must be ready to take over during the approach and particularly close to the ground if the student becomes unresponsive to directions or responds inappropriately. The instructor should “guard” (i.e. lightly grasp) the stick against the student over-controlling the elevator in both directions. This requires maintaining a light hold on the stick and be aware that a “negative G” bunt manoeuvre (as occurred in the double fatality event) might lift the instructor’s hand off the control column!

During the first few occasions when the student is being directed through the approach and landing sequence, allow the student to control the glider with the control column (with the instructor “guarding” the elevator with the right hand), while the instructor retains control of the airbrake. This allows the student to concentrate on maintaining just direction and speed control while the instructor controls the aiming point.

The instructor must monitor the student’s workload on final approach. If the student stops responding to the instructor’s directions, this is a sign that the student is becoming overloaded and the instructor must take over for safety and training benefit.

In the event of a high ballooned landing or serious bounce, the instructor must respond immediately by taking over control, closing the airbrakes and stabilising the aircraft off the ground, before resuming the landing with an appropriate airbrake setting. At this stage, lower the nose if necessary to stabilise the aircraft, but accidents have also resulted from the instructor lowering the nose excessively in this situation too!

Caution: Even though the instructor may be guarding the stick, this will not prevent the stick moving in response to a student applied input. This is because the instructor’s hand and arm will be relaxed. It takes about 1-2 seconds for the instructor to then react where discrimination and judgment are involved. Remember, 60 knots is 100 feet per second – so an instructor will have very little time to react to a steep push-over at heights below 200ft.

Initial Training

Before the student attempts their first directed landing attempt, try the following upper air work exercise (Note the student must have a sound understanding of the use of the airbrakes prior to this):

- At a sufficient height for extended upper air work, select an appropriately located and prominent aiming point in front of the glider at (approximately) a half dive brake setting approach angle.
- Demonstrate, direct and monitor the student through varying the airbrake setting with a constant airspeed (while noting the resulting undershoots and overshoots produced), varying the airspeed with a constant airbrake setting (while noting the increased elevator effectiveness with increased approach speed), and finally varying both airbrake setting and airspeed together.
- Continue until the student can reliably manipulate both controls with appropriate inputs to the desired effects.
- Extend (still at upper air work height) to the simulated ‘air landing’ exercise by saying something along the lines of “OK, we are now at 50 feet...maintain the half brake setting, maintain your approach speed...now 20 feet ...start to flare by bringing elevator back a little to reduce our sink rate...now a few feet off the ground, keep elevator back pressure to hold off...now we are stalling just above the ground and now we have landed!”. Then recover from the resulting stall obviously...!

- Before allowing a student on the controls during final approach, the instructor must brief and demonstrate the importance of a stabilised approach. A useful teaching tip for initial circuit training is to commence the circuit several hundred feet higher than normal with the same angular references on downwind and base leg. This will increase the time on final approach for the student to practise control adjustments and achieve a stable approach.
- A common early student error is to overcontrol with airbrake corrections on finals, so before flying it is worth spending time with the student in the cockpit showing the amount of movement of the airbrake handle relative to the amount of airbrake/spoiler movement on the wings.
- As with all glider flying, the student must be taught to fly circuits with a light, relaxed grip on the control column and make control inputs using wrist action rather than moving the entire arm.

Optimism Bias

All pilots and instructors are vulnerable to various cognitive biases and errors; it is part of the human condition. Researchers have shown the most pervasive bias is *optimism bias*, where the person has an *expectation of success*, driven in part by the *illusion of control over everything*, and the *planning fallacy* where success is overestimated and resources, costs and negative consequences underestimated, plus a lack of consideration of *complexity and chance*.

Complacency can in turn drive a lack of emphasis on the final part of the *demonstrate-direct-monitor* training cycle. Complacency, plus optimism bias, plus experience with numerous past successes, might easily combine to make the instructor late to intervene in a rapidly deteriorating situation close to the ground.

Optimism bias may also be compounded by a *halo effect*, where positive impressions made from one characteristic (e.g. nice person, keen, seems on the ball) are assumed to extend to other areas of competence. An experienced instructor may make a high assessment of their ability to read students and detect limits in their competence, when that student may still be subject to incorrect responses or training gaps.

For these reasons, it is particularly important for instructors to consider their own susceptibility to optimism bias, to consider pre-flight the thresholds of intervention that should be applied during training sequences.

“Assume the worst; hope for the best.”

Remember your threshold of intervention: unless you are really sure of your ability to talk the student through any sort of upset, be prepared at all times to **TAKE OVER CONTROL AND INTERVENE EARLY!**



Christopher Thorpe
Executive Manager, Operations
For the GFA Operations Panel

5 July 2019