AVOIDING UPSET

‘Don’t drop the pilot’ is the message from BGA safety team

IN EARLY blood transfusions, the recipient was connected directly to the volunteer donor. The operation risked killing not only the patient but the healthy donor as well.

The gliding equivalent is the aerotow. The difference is that the outcome is mainly in the hands of the recipient glider pilot, who generally survives unscathed. Aerotow upsets have killed four tug pilots in the 45 years of our records, and there have been nearly 80 other upsets. One third of these upsets were in the past six years, with seven in 2019 alone; some of them were very close shaves that could easily have ended differently.

An aerotow demands skill and attention (Jordan Bridge)

CLIMBING OUT OF THE DIVE, I WAS NOTICEABLY BELOW THE HEIGHT OF THE ELECTRICITY PYLONS

■ Clubs can obtain printed copies of Safety Briefings from the BGA Office.

Mechanics of aerotow upsets

An aerotow upset occurs when the glider, via the towrope, exerts a load that takes the tug outside its range of controllability [1-6]. This happens when the glider pilot allows the glider to stray too far, or too quickly, from its proper position behind the tug.

A lateral or vertical force can overpower the rudder or elevator and stall the fin or tailplane. The most dangerous case is when this lifts the tail and puts the tug into a dive. The two aircraft tend to diverge, as the tug descends and the glider climbs above it.

Longitudinal forces then come into play as the rope tension rises, slowing the tug and causing reduced control authority and potentially stalling the aircraft. As the weak link in the tow rope will typically sustain the empty weight of the aircraft, deceleration can be very rapid. A ‘slingshot’ or ‘kiting’ can then occur, as the glider ‘winch launches’ above the diving tug.

Accident and incident reports show that tug upsets develop very quickly with little prospect of releasing the cable in time – and, with the towrope under load and possibly at an unusual angle, the release can in any case be difficult to operate. The tug pilot can be thrown around enough to make it hard even to reach the release or guillotine.

Low-level aerotow upsets

Half of the aerotow upsets in our records occurred below 500ft: four proved fatal for the tug pilot, and half of the remainder could easily have ended similarly. In early years, most happened because the glider pilot lacked the skill to control the glider.

More recently, the principal cause has been distraction. Dealing with open airbrakes, insecure canopies, instruments, flaps, ventilation, wing drop, a camera and an insect sting have all distracted otherwise competent glider pilots from maintaining position behind the tug. Many of these pilots were very experienced.

What the tug pilots reported:

■ ***From 250ft the tug was pitched 60° nose down and I released the rope. I kept the nose down to regain speed and managed to pull out of the dive at about 60kts. I estimated the ground clearance as less than 50ft.***
– Glider pilot not current on aerotow, 2018.

■ ***As the K-13 rose rapidly it lifted the tail of the tug. P1 in the K-13 released. Tug pilot pulled out at a height that his tow rope clipped the trees underneath him.***
– Distracted by open airbrakes, 2017.

■ ***I looked into my mirror to see the glider ascending very rapidly until it was out of sight above me. I felt my nose drop sharply and could not correct it with elevator. I was approx 150ft and fortunately flying into the valley.*** – Distracted by open airbrakes, 2016.

■ ***The tail of the tug started to lift. I steadily applied back stick to counteract, but to no avail. The nose-down attitude increased to a steep dive. I reached for the guillotine and on the second actuation felt the cable had gone. With the stick still back, the tug rounded out from the dive and started to climb. This happened very very quickly. I was noticeably below the height of the electricity pylons.*** – Distracted by insecure canopy, 2015.

Aerotow upsets at higher altitudes

The other upsets in our records mostly took place above 1,400ft and generally fell into two groups: pilots failing to check that the rope had detached before turning; and instructors allowing students to get too far out of position. Lateral upsets – commonly during training – sometimes evolved into vertical upsets, and half of the higher-altitude upsets developed into a ‘slingshot’. Distraction, including pointing out

landmarks, was again a factor; and turbulence played a role in a handful of cases.

Although there is height to recover, aerotow upsets at higher altitudes can be deeply distressing for tug pilots. After the first sortie during a deliberate investigation of aerotow upsets some years ago, the tug pilot is reported to have landed to fetch a parachute. Both tug and glider pilots often report feeling shaken even though no damage or injury resulted. They should not fly again until fully recovered.

■ ***At 3,200ft I waved the glider off. My view from the forward screen changed, in an instant, from blue to green!!! I have read about how quickly these incidents develop, but it was truly eye-watering how rapidly things happened.*** – Glider pilot turned without releasing, 2015.

Contributory factors

In addition to distraction, a number of physical factors are known to increase the likelihood or speed of an aerotow upset:

- **Short towropes** amplify the effect of the glider's displacement and make the glider pilot's job harder. Retractable towropes can be limited in length by the storage drum.
- The glider's **belly hook** provides a lower corrective moment than the nose hook, and is more conducive to 'slingshot' or 'winch launching' behind the tug.
- **Lightweight tugs** will succumb to lighter lateral forces than heavier tugs and are more rapidly decelerated [7.8].
- **Turbulence** requires continuous correction.
- **Wind gradient** can encourage the glider to climb quickly above the tug.
- Gliders with **high wings** and/or **low wing loadings** will be more easily moved out of position by gusts and snatches.
- Longitudinal stability is reduced by an **aft centre of gravity** and can be worse with an **all-flying tailplane**.
- **Poor trim** and **changes in flap setting** will affect the glider balance.
- **Poor visibility** can hinder judgement of vertical position.
- **Pilot inexperience** and **lack of aerotow currency** affect a pilot's ability to maintain position [9].

Both the glider pilot and tug pilot should assess the likelihood of these factors before deciding to launch.

Tow position

Flying too high behind the tug reduces its control margin but, as movement is more important than position, the stability of the tow position is a major consideration. In the normal tow position, the glider should be a little above the tug's slipstream so that lateral control is not disturbed by the downwash – a particular consideration for heavy, long-wing gliders. If the low tow position is adopted, it's important that the transition back to the normal tow is made smoothly without overshooting.

Lightweight tugs may create less downwash, and fly more happily at the speed of slower gliders, but the acceptable deviation in tow position is smaller [7].

Safe aerotowing

Before launching, check for any of the above risk factors, and mitigate them or postpone launching if necessary. Prepare the cockpit to avoid later distractions, and don't rush your pre-flight checks. If possible, establish radio communication with the tug pilot.

Avoid distractions during the tow and give your full attention to maintaining position. An ab-initio pilot or student won't mind a gap in your patter for the first part of the aerotow, especially if you explain why beforehand. Leave fiddling with the instruments and ventilation until later.

There's no reason to raise the wheel until you've released: it'll only save half a groat from your launch fee, and it shows that your attention is elsewhere. Remember that others could copy your example. As a deterrent, one CFI has briefed his tug pilots to release any glider that retracts its undercarriage on tow.

Instructors should leave aerotow exercises until a safe height, guard the stick closely and keep a hand on the release, and take over instantly should things go awry.

The BGA is reviewing its advice about lookout during the aerotow. Current thinking is that, at least until a safe height has been reached, the glider pilot should focus upon the tow, ensure that the tug remains within his/her field of view, and leave the wide lookout scan to the tug pilot. When looking out before release, the pilot should remain alert to the upset risk.

At the end of the tow, check that the cable has released before turning. Pilots have mistaken trim, airbrake and undercarriage levers for the cable release, misinterpreted noises, or simply assumed that the cable had detached. It's crucial to check visually.

An aerotow is formation flying, and demands skill and attention. You have the tug pilot's life in your hands.

Tim Freegarde and the BGA safety team

I HAVE READ ABOUT HOW QUICKLY THESE INCIDENTS DEVELOP, BUT IT WAS TRULY EYE-WATERING HOW RAPIDLY THINGS HAPPENED

■ For more information, see the Safe Aerotowing and other sections of the BGA website [1-4], section 4-17 of the BGA Instructor Manual [5] and *Aerotowing Gliders* by John Marriott [6].

[1] BGA Safe Aerotowing
https://tinyurl.com/flyright2004
[2] BGA Managing Flying Risk
https://tinyurl.com/flyright2005
[3] BGA Towing/Operating Tug Aircraft
https://tinyurl.com/flyright2006
[4] BGA Aerotowing Guidance Notes
https://tinyurl.com/flyright2007
[5] BGA Instructor Manual, section 4-17
https://tinyurl.com/flyright2008
[6] J Marriott, *Aerotowing Gliders*, AuthorHouse, Milton Keynes (2011)
[7] *Positions extremes et ULM*, FFVP Actions Vitales! (8), 13 (Nov 2018)
https://tinyurl.com/flyright2009
[8] Swiss accident report 2133 (2007)
https://tinyurl.com/flyright2010
[9] Swiss accident report 2346 (2017)
https://tinyurl.com/flyright2011

PREVIOUS 'FLY RIGHT' ARTICLES

The Perils of Distraction (Apr/May 19)
Keeping Safe in Thermals (June/July 19)
Why It Is Good to Think Ahead (Aug/Sep 19)
The Effects of Wind Gradient (Oct/Nov 19)
A Fun but Safe Introduction (Dec 19/Jan 20)
Stop the drop (Feb/March 20)