SSF Soaring Safety Foundation

Winch launching revisited
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Thanks to BGA for the background and release for use of most of this material which was presented by Hugh Browning at the OSTIV TSP meeting in Delft in Nov07.

A little over a year ago in this column, we reported on the documented losses/fatalities due to the dangers of winch launching compared to aerotow. In one case, there were 8 times as many fatalities/major injuries during winch launch compared to during aerotow. (To be clear, we're talking about what happens to the glider after a launch failure, i.e. other than a normal release.) Does that mean that winch launching is too hazardous to consider? Is there anything that can be done to counter the risks?

First, let's consider launch failures as divided into these categories:

GROUND ROLL If the wing drops on the ground the glider may rotate about the wing tip and cartwheel. After the wing drops the cartwheel can be so rapid that no recovery by releasing or other means is possible. This hazard must be anticipated.

ROTATION During any part of a winch launch the lift required from the wing is greater than in cruising flight because the lift force is tilted away from the vertical and extra lift is needed to oppose the pull in the cable. In addition, during the transition from level flight at take off to full climb the wing must generate force sufficient to accelerate the vertical speed of the glider from zero to about 40kts. The combinations of these means that during rotation the lift factor can be very high. Since the stall speed is proportional to the square root of the lift factor, if stall occurs during rotation, it is a dynamic or high speed stall which may result in a snap roll of the glider which further means that the glider may be spinning while attached to the cable. Hitting the ground inverted in this case is not uncommon for such a condition. Short rotation times increase the stalling speed because they increase the vertical acceleration. Once the glider has stalled, recovery is unlikely. This hazard must be anticipated.

<100FT It is to be noted that many of these type occurrences are with instructors simulating a cable break. When there is a cable break/power loss, the glider first climbs without power representing pilot reaction time, followed by pushover, a recovery dive and finally pull out to level flight for landing. Variables that affect safe recovery include airspeed and climb angle at the moment of power loss, reaction time, pushover g, recovery dive steepness and target airspeed, pullout g, and glider stalling speed and L/D. Every 0.5 seconds of reaction time delay results in about a 7.5% loss of airspeed. This means that a 2" delay will likely put the glider at stalling speed with resultant crash due to unavailable recovery altitude. The other side of the concern for rapid reaction time is that of overdoing the amount of reaction, putting the glider into too steep a dive from which recovery is impossible. Simulation studies have shown that during a power loss at 70ft a single mistake of lowering the nose too much or not enough, or being one second late in reaction can make a crash inevitable, a perfect scenario for instructing

accidents wherein the student error makes instructor recovery impossible. These hazards must be anticipated.

100FT Half the winch launch fatal accidents occur after power loss in mid-launch. Even tho the glider attitude may look satisfactory at the beginning of the recovery dive after a mid launch failure in a steep climb, it is essential to maintain the dive until the proper approach speed is attained. Otherwise, a stall/spin after failing to restore safe airspeed is likely if any maneuvering takes place. Even after successful recovery to controlled flight, poor pattern-to-landing technique when at low altitude can result in a crash from an undershoot, overshoot and hitting objects, including flights with instructors who let the student-flown pattern deteriorate until recovery becomes impossible. These hazards must be anticipated.

Can your field on which you plan to operate a winch support a landing at 90° to takeoff? That's what can happen when there's not enough acreage to land straight ahead nor enough altitude to safely make any kind of turns, including not enough to turn back toward where you started, all because your recovery from the launch failure results in a glide path 90° to the takeoff.

In an effort to improve the safety record of winch launching, BGA undertook a massive program which began with the formation of a Safety Initiative Team to examine the issues. After investigating the conditions of winch launching, it became clear that most pilots did not fully understand the circumstances which could lead to winch launch fatal/serious injury accidents nor the very small margin of safety that could exist after power loss below 100ft. Information about their study was provided to BGA Club chairman and professional managers, BGA instructors and all BGA pilots through extensive meetings, written material, and brochures.

So, what to do? The following is from their brochure, which they have kindly made available for reprint by SSF:

SAFE WINCH LAUNCHING		
Truncated advice such as this is necessarily simplified. Site specific factors may require many other considerations; however the key points listed, if rigorously applied, should help prevent many sad and unnecessary winch launch accidents. Pilots should consider the following hazards before every winch launch:		
STAGE	**HAZARD**	**AVOIDANCE**
Ground Run	Wing touches ground, glider cartwheels or ground loops violently	Start the launch with your hand on the release. If you cannot keep the wings level, release immediately
Rotation	Stall/spin during rotation	Avoid taking off with a significant amount of yaw present. Maintain a shallow climb until adequate speed is seen with continuing acceleration. Ensure the transition from level flight at take off to the full climb (typically 35°) is controlled, progressive, and lasts at least 5"

	Stall or heavy landing after launch failure below 100’	Immediately lower the nose to the appropriate recovery attitude. Minimizing the reaction time is crucial. Do not use the airbrakes until the glider has attained an appropriate attitude combined with a safe speed. Instructors: Simulated power loss with less than 50’ and 55knots by instructor simulation only.
Climb	Stall or heavy landing after launch failure	Adopt the recovery attitude, do not turn or use the brakes until the approach speed is attained. Land ahead if it is safe to do so.
	Controlled flight achieved after launch failure but subsequent stall, undershoot, overshoot, heavy landing or collision	Plan provisional circuit options before taking off.

For those contemplating winch launching, it is highly recommended you contact experienced winch launching people who fully understand the points made within this very short discussion. Written material, including the brochure from which the above from BGA is taken, is available from SSF (www.soaringsafety.org).