

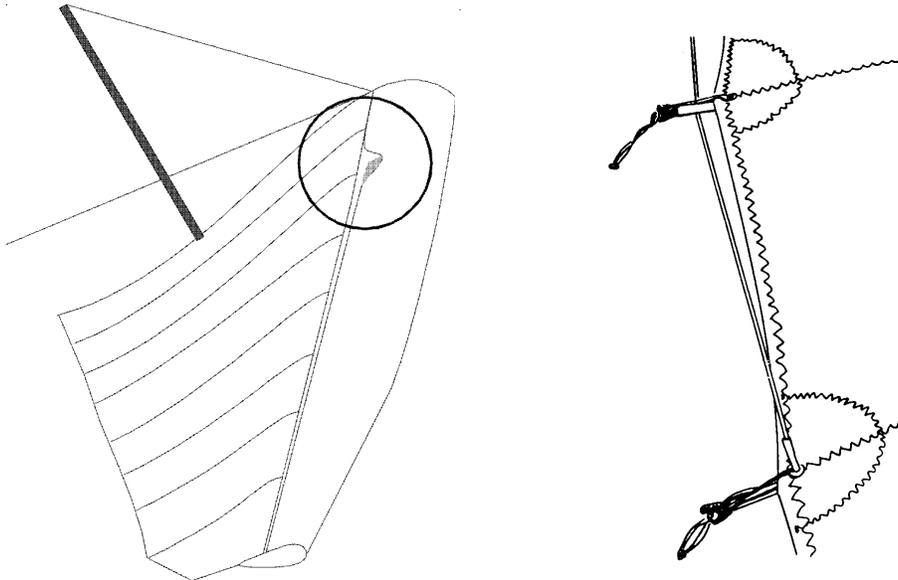
Distorted Mylar Insert And Bridle Cable Snagged Under A Batten

Background:

There are two common set-up errors that, if not corrected during pre-flight inspection, can cause potentially dangerous effects on the glider's flight characteristics.

1) Distortion Of The Airfoil Caused By Folded Mylar Insert

While inserting the battens during set up of the glider, it is possible for the tip of the batten, acting through the sail, to catch the rear edge of the Mylar leading edge insert, pushing it forward and folding it under in the process. This will cause a raised area of discontinuity in the Mylar pocket portion of the leading edge of the wing, which in turn will cause a significant disruption of the airflow. The airflow can be affected over a wide area both inboard and outboard of the actual distortion. The result is that the affected portion of the wing will stall prematurely, at a higher airspeed and lower angle of attack than normal. Consequently, the glider will be difficult to control in the normal minimum sink airspeed range, will tend to stall repeatedly if flown in this speed range, and will tend to fall off into a diving turn towards the affected wing. The glider will exhibit delayed recovery from the stall, and the pilot will experience unusual negative pitch pressures in the control bar.



2) Bridle Cable Snagged Under A Batten

It is possible during set up that a bridle cable may end up passing underneath the rear end of the next inboard batten. Because it causes the cable to follow other than a direct route to its attachment at the kingpost, this significantly shortens the effective length of the bridle cable. If this condition is not corrected during pre-flight inspection, the cable will pull up hard on the trailing edge in flight in the vicinity of the batten under which it passes. This will cause the glider to trim slower than normal, and possibly in a stall. It will also cause a turn towards the affected wing, and it will cause the glider to be generally less responsive in roll, and more difficult to control.

Distorted Mylar Insert And Bridle Cable Snagged Under A Batten

Inspection / Service Requirement:

The primary and preferred solution to either of the above problems is to avoid them by using proper set up procedures and by always performing a proper pre-flight.

1) Folded Under Mylar:

In the case of a distortion due to folded under Mylar, proper set-up procedures means to avoid the insertion of the longer cambered battens in ways that increase the chance of the Mylar being caught and folded under by the front tip of the batten. Avoid, if possible, installing the battens with wind pressure on the top of the sail. (Setting the glider crosswind instead of tail into the wind is helpful in this regard.) When pushing the batten in, keep the trailing edge of the sail as low as possible, and, if necessary, lift the sail with your other hand in the area just behind the Mylar pocket as the front tip of the batten slides through this area.

Proper pre-flight procedure requires that you carefully sight down the entire length of the top surface of the leading edge, including the full chordwise length of the Mylar pocket (the distortion described will tend to occur at the back edge of the Mylar pocket, most often towards the root, as illustrated, and it may not be readily noticeable). If you notice such a distortion, de-tension the crossbar, remove the battens in the affected area, smooth down the Mylar insert, and re-install the battens.

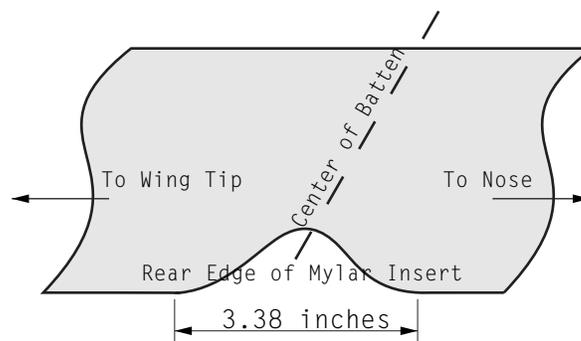
2) Bridle Under A Batten:

During set-up, if you connect the bridle ring to the clip on the kingpost, and spread the wings most of the way before you install any battens, it will reduce (though not eliminate) the chance of catching a bridle line under a batten. Your pre-flight should always include a full inspection of the glider from the trailing edge. During this inspection, you should check that the bridle balls are properly seated in the grommets, that the bridle ring has not been twisted prior to installation, and that no bridle line passes under an adjacent or farther inboard batten. Note: If for any reason you de-tension the crossbar after doing your pre-flight, you must pre-flight the bridle lines again, as this is a perfect opportunity for a bridle line to become caught under a batten.

Mylar Re-Design Available For Ultra Sports and Eagles:

In our experience, the glider model that has been most susceptible to the problem of the Mylar becoming folded under during set up is the Ultra Sport 147. In general, gliders with lesser amounts of leading edge sail tension are more susceptible to the Mylar folding under problem, although we have observed it even on competition class gliders, so no glider should be considered immune.

On all three sizes of Ultra Sports, and on all three sizes of Eagles, we are now putting a scallop in the trailing (aft) edge of the Mylar insert, in the location of each inboard batten that might most likely cause the Mylar to become folded under. The diagram below shows the shape of the scallop and it's orientation to the line of the batten pocket.



Distorted Mylar Insert And Bridle Cable Snagged Under A Batten

We have found that this scallop greatly reduces the chance that the Mylar will fold under during set-up. If you have an Ultra Sport (especially a 147), or an Eagle, and if your Mylar inserts do not have these scallops, we recommend that you order new Mylar inserts through your dealer and have them installed. (To maintain your glider at its highest performance level, it is a good idea to replace your Mylar inserts periodically anyway – as the Mylar picks up permanent creases it tends to cause the same type of airflow disruption that the folded under Mylar causes, only to a lesser degree.) If you have another model of Wills Wing glider, and you have had a problem with the Mylar folding under during set-up, you can cut the scallops into the trailing edge of your Mylar, after carefully marking on the Mylar where the batten intersects the Mylar trailing edge.

Dealing With Configuration Abnormalities In Flight:

Should one of these set up errors occur, and not be discovered and corrected during pre-flight, follow the procedures below for dealing with the situation in flight.

- 1) **FLY THE GLIDER.** This is the number one rule for any in flight aircraft emergency. Maintain directional control and control of airspeed and angle of attack, and maneuver away from terrain and other gliders immediately.
- 2) **DETERMINE THE PROBLEM.** While maintaining control of the glider, allow the glider to tell you what's wrong. If the glider is falling off on a wing and repeatedly pitching down, it is likely you have a folded under Mylar insert. If the glider is turning one direction and trying to pitch up, it is likely that the problem is a bridle cable under a batten. While maintaining control of the glider, look up at the affected wing (the wing the glider wants to turn towards). Folded under Mylar will cause an indicated stall as seen by flow reversal on the tuft on that wing, even though your airspeed is well above the normal stall speed. At the same time, you will feel negative pitch pressure in the control bar if flying near minimum sink airspeed. A bridle cable under a batten will be visible to you as you look along the trailing edge. It can also affect the local flow and therefore the wing tufts, but will usually cause a pitch up tendency, felt as positive pitch pressure in the control bar.
- 3) **CHOOSE AN APPROPRIATE FLYING SPEED.** If the problem is folded under Mylar, fly faster – 30 – 35 mph. At a higher speed, no part of the wing will be stalled, and the glider will be relatively easy to control and will fly almost normally. If the problem is a bridle cable under a batten, you are better off to fly more slowly, at 22-25 mph, as the turn induced by the batten being pulled up is less at lower speeds. Do not allow the glider to stall, however, as this will compromise your directional control.
- 4) **CONFIGURE THE GLIDER FOR BEST CONTROL.** If the glider is equipped with variable geometry, set it to full loose. This will afford maximum control authority, and put the most slack in the bridle cables.
- 5) **FLY TO A SAFE LANDING AREA AND LAND.** If you have a choice, select the largest, easiest landing area. If you have a choice, fly an aircraft pattern away from the turn in the glider. (If the glider is trying to turn right, fly a pattern with all left turns). If possible, go to full upright position with hands on the downtubes early in the approach, so you don't have to change positions at low altitude. Maintain the pre-selected flying speed for best control throughout the pattern, for as long as possible. Do not dive your approach, or slip any of your turns. Instead vary the flight path to control your touchdown point. As you slow down on final, apply an appropriate amount of opposite roll control against the turn as necessary to maintain straight flight. (This will be a continuously increasing amount in the case of folded under Mylar.) When flaring to land, apply pitch up control and roll control against the turn simultaneously, and run out the landing.