

What's

STOPPING

DO YOU KNOW EVERYTHING YOU NEED TO KNOW ABOUT YOUR BRAKE SYSTEM?

You?

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If you read the last couple of ASMs you may have noticed that several of the high profile, serious incidents started because of a simple, low profile item – the failure of the main brake locks to remain locked on during the opening sequence, and then to release when required after the canopy has opened. APF incident reports regularly record problems in this area (about 3 or 4 times a month), sometimes due to a failure on behalf of the packer to set the brakes as necessary, and sometimes because the system (or setting) fails during deployment.

See the side box for some of the comments that often get submitted in the reports and remember that the reports received at the APF are usually only the ones that result in a cutaway.

There are many more unreported incidents where the brake system fails but where the jumper deals with the problem in the air and gets the canopy under control.

Brake setting has ridden the high performance canopy boom to prominence. A few years ago a brake off (or locked on) would have usually lead the jumper to simply back-riser down to a landing (this was the drill taught on many student courses).

However, like line twists on opening, a brake malfunction is now very often a cause for a cutaway, partly because many jumpers are not comfortable on back risers but also because flying a high performance canopy on back risers is a VERY touchy affair which may result a dramatic, premature stall (as some members have found out the hard way).

Add to this the fact that there is often very little time to properly evaluate and deal with a brake problem due to rapid height loss (such as in the case of a spinning “one brake on/one brake off canopy”) so getting onto the reserve is often the only sensible recourse. This could also be complicated by line twists adding to the control problems.

Setting your brakes is not a particularly difficult thing to do and the rig manufacturers have done a good job over the years to make a properly set main brake secure while receiving very little care and attention over many jumps.

In fact this leads to one type of failure – the fact that the system does operate so well on so many occasions leads to the complacency that “little maintenance required = no maintenance required”.

There are some other common traps with toggles:

Locking Loop

Some years ago all toggles had a small “locking loop” that needed to be passed through the finger-trapped loop on the brake line (many older and larger systems still use this) but many of today’s jumpers have not been taught this system since they first learnt to pack on their own gear.

Most current gear does not have this locking loop and the stiff part of the toggle goes directly through the brake line loop.

Mixing or misusing the two types of packing systems is not secure. Everyone should know their own system, and if you get presented

with a set of risers that look different be sure to get experienced advice the first time you pack it.

Guide Ring

Be sure that the upward opening force of the brake line is restrained by the guide ring. Brake locks have failed when opening force is only held by the fabric tunnel above the guide ring (which is there just for stowing the toggle end).

The instructions from the Talon manual are quite specific: “Set deployment brakes by pulling steering lines down until locking loops are just below the guide ring on main risers. Insert main toggle upper end into locking loop on steering line and into fabric loop above guide ring. Stow excess steering line as deemed appropriate by length.”

Another problem can arise if the entire steering toggle is able to pass through the guide ring. This may only occur if the toggles and risers are mixed and mis-matched and their compatibility should be checked by the packer during assembly. Risers and toggles are built as a set by each rig manufacturer and it is better to keep the set together.

The Fabric Loop

The fabric loop to secure the toggle end is particularly important if your slider comes down past the connector links. The brakes can be unlocked simply by pushing the top of the toggle down and the slider can do this if the top end of the toggle is not secure. There is a suggestion that soft links may accentuate this problem since they hardly impede the slider’s downward speed (anyone have any thoughts on this?)

Stiff Upper End of Toggle

Another regular reported reason for “brake locked on” is if any thicker part of the toggle is pushed through the locking loop (past the stiff bit which is built straight sided or tapered). In particular do not let the brake toggle grommet, if you have one, pass through the locking loop. Once the tension comes on any lump/grommet cannot be pulled back though. This can also happen if risers and brake toggles are mis-matched so that too much toggle extends above the guide ring.

Velcro

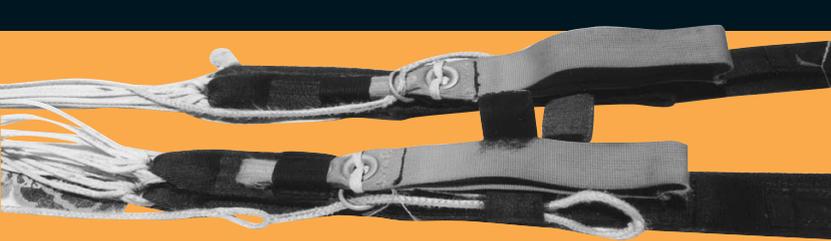
It should go without saying that if velcro is used to secure your toggles then it needs to be in good condition. Having the brakes flapping loose during deployment is asking for them to catch on something and be pulled loose.

Line Stowing

Velcro is less common on newer systems, not least because it often damages the brake lines. Stowing the lines directly on hook velcro is inviting early wear and may necessitate early replacement. If your system does not have a neat, clean method of securing the spare line then talk to your rigger.

There is a tendency with some rigs that have very short lines (where little line needs to be stowed) to leave the excess free. This may look





cool but is an invitation for a brake release during deployment if the line catches something (camera flyers especially, take note).

Vectran

Different materials wear differently and one reason you see very few kevlar lower brake lines (except on reserves) is due to its poor performance against abrasion. Vectran has similar problems and is not recommended for lower brake line use.

Get Knotted

Most material used for brake lines is to some extent, slippery. This means that some knots will not hold well. Good knots include bowlines, overhand knots and any knot where the end is sewn in place, preferably after finger trapped the excess line.

DO NOT attach brake toggles with just a series of half hitches. Incident reports regularly include these knots coming undone under tension usually with the comment "...and the brake toggle just came off in my hand".

Getting Out of the Corner

Upper brake lines (above the locking loop) are tested each jump by opening shock and if left too long before replacement will eventually break – you then get to make the decision between back risers and a reserve ride. Lower brake lines may not be stressed until you flare, by which time you have no other options if one fails, especially if you are deep in the corner and relying on your brakes to save your life through the swoop. If this is how you fly your canopy then the brake lines should be treated like your reserve – life saving parts that need regular maintenance by a qualified rating holder – your life really does depend on them.

Summary

Brake locking has developed over many years of skydiving and most manufacturers produce very reliable systems. However, brakes are one of the high wear areas of a rig and need maintenance to remain reliable. Intermixing components from different manufacturers is an invitation for trouble and usually negates all the careful testing done on the system.

High performance canopies need the full support of ALL their components to operate at their full potential. Spending an afternoon searching for your free-bag is no compensation for saving a few dollars by failing to get your gear regularly examined by a qualified technician.

It is often the case that you will not notice your own system wearing because the changes are imperceptible so as far as you are concerned it has always looked like that. Brake setting may be only a tiny part of your jumping experience, but if it breaks down, you'll probably wish you had made more of it.

Note: Some of the brake images used in this article are wrongly set.

Some comments verbatim from APF Incident Reports:

- Main brake locked on
- Main brake caught lines above slider
- Toggle came off
- Main brake came off on brake release
- Brake toggle came off, landed on rear risers
- Main brake knotted around riser
- Knot on brake line jammed in brake release
- Problem with main brake tangling
- Toggle came off, landed on back risers
- Main brake came off on opening, correct knot?
- Brake lines replaced, not bar tacked
- Main brake locked on - landed solidly
- Main brake could not release
- Main brake released on opening (thought it was a line over)
- Main brake incorrectly rigged
- Brake line separated, not bartacked
- Could not release main brake?
- Jumper knocked brake off while collapsing slider?
- Spinning on opening, main brake off?
- Released toggles and one went thru ring, cutaway
- Brake loop snapped on opening
- Broken steering line
- Broken brake line
- Only released one brake?
- Main brake improperly set, locked on, could not release, cutaway at 1100ft