DHV-Safetytest LTF A- und B- Paragliders, Part 7

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This report extends the work publicised in DHV Info 174 which can also be found under www.dhv.de. Details on how we have classified the gliders, the relevance of different manoeuvres to accident statistics, German airworthiness requirements (LTF certification) and other details can be found there. The DHV safety and technical department tested the following gliders in the 7th round of its ongoing safety test program:

Glider	LTF Test number	Weight range
LTF-A		
Swing Discus M	DHV GS-01-2080-13	80-105 kg
Gradient Bright 5.26	DHV GS-01-2071-13	75-100 kg
Airdesign Eazy M	EAPR-GS-0089/13	80-105 kg
LTF-B		
Sky Paragliders Atis 4 M	AIRT GS_0631.2012	73-95 kg
Gin Gliders Carrera S	AIRT GS_0783.2013	75-95 kg
Nova Ion 3 S	DHV GS-01-2057-13	80-100 kg
UP Kantega XC 2 M	AIRT GS_0813.2013	80-115 kg

Launch preparations

What is tested:
In particular we look at the risers and line systems, how easy they are to sort, if looping or knots in the lines are easy to see or not and the functionality and ergonomics of the risers.

The risers on **Airdesign's Eazy** are particularly well designed: B-risers and outer A-risers are clearly marked with stickers to help prevent the wrong riser being chosen in maoeuvres such as B-stalls and big-ears. It's not just a gimmick – it is a feature useful in real-life – in March this year a serious accident occurred when a school pilot ended in a spin after pulling the wrong riser (stabilizer line). Somewhat unusual is the way the outer A-line attaches to the riser with its own mallion, instead of having a separate riser extension to aid big-ears.

Swing's Discus and **Gradient's Bright 5** both have uncomplicated riser sets with no associated difficulties. On all three LTF-A gliders, line sorting was simple, especially due to the clear colour sorting – well suited to beginners.
The third version of **Nova's** low-end LTF-B glider the **Ion 3** has a new line geometry: more main support lines, but much thinner that previous models, and many thin unsheathed lines in the upper gallery. The traditional advantage in simple line sorting for Nova gliders is lost with the new geometry. Risers are uncomplicated.

Sky's Atis 4 follows practiced design principles and does not use any plastic rods in the canopy. The risers split into 5 and connect to a complete set of sheathed lines. Sorting is easy, but the canopy mid-point is unfortunately not marked.

Gin Gliders Carrera has a complete set of unsheathed lines, which require appropriate attention when sorting, particularly as the upper gallery lines tend to tangle somewhat. The risers are uncomplicated but the outer A-line does not have a separate extension (design similar to the Eazy). **UP's** LTF-B **Kantega XC 2** has a set of sheathed lower suspension lines and unsheathed upper gallery lines which again require a close look on sorting. The thin risers are uncomplicated.

Launch preparations			
Glider	**Simple**	**Average**	**Challenging**
Swing Discus M			
Gradient Bright 5.26			
Airdesign Eazy M			
Sky Paragliders Atis 4 M			
Nova Ion 3 S			
UP Kantega XC 2 M			
Gin Gliders Carrera S			

Launch characteristics

What is tested:
Inflation, climb rate, requirements to stabilise and necessary brake inputs.

Airdesign seem to have payed particular attention to making a glider easy to start for beginners. The **Eazy** needs a sharp impulse to begin followed by a bit of gentle guidance. Then the canopy climbs slowly and homogeneously and slows automatically just before the zenith. No overshooting, and only little brake inputs are required to stabilize it there. Gradient's Bright 5 is also simple to start, but somewhat different to handle. The canopy inflates with a gentle start impulse and doesn't provide the pilot with much feedback as it climbs. The climb is homogeneous and without any break-out tendencies and slows automatically just before the zenith. No large brake inputs are required to stabilise it there. Care should be taken during the control check phase – too much brake will cause the canopy to fall quickly back behind the pilot. **Swing's Discus** climbs slowly, which is not a disadvantage on steep launch sites. On flatter starts, the canopy needs a marked impulse to inflate and then constant guidance to the zenith, otherwise it tends to hang behind the pilot. On reaching the zenith, only a little brake is required to stabilise it there.
Sky's Atis 4 does not always inflate homogeneously, and climbs occasionally at an angle – maybe this is a result of the missing plastic rods. The canopy climbs quickly and needs a good jab on the brakes to stabilise at the zenith. **Nova's Ion 3** is still a reference mark for launch characteristics. Constant inflations and climbs, just the right amount of pressure to indicate to the pilot where the canopy is, and neutral behavior at the zenith requiring moderate to marked braking to stabilise, depending on the launch slope gradient.

Gin's Carrera needs to be layed out in a pronounced crescent, otherwise the wingtips have a tendency to overtake the canopy middle during inflation, which results in a horseshoe. With a gentle impulse the canopy climbs quickly and homogeneously without delay. There is no noticeable slowing before the zenith. Care needs to be taken that the start impulse is not too severe, otherwise marked brake input (or severe on steep slopes) is required to prevent the canopy from overshooting. **UP's Kantega XC 2** is quite different, and has a tendency to hang behind during launching. With constant guidance the canopy then climbs to the zenith and requires little or no brake to stabilise. Asymmetric inflations are difficult to recover from, and careful brake input during the control phase is required otherwise the canopy may fall back down again.

Launch characteristics			
Glider	**Delayed**	**Balanced**	**Dynamic**
Airdesign Eazy M			
Gradient Bright 5.26			
Swing Discus M			
UP Kantega XC 2 M			
Gin Gliders Carrera S			

Nova Ion 3 S					
Sky Paragliders Atis 4M					

Test manoeuvres / recovery from instability
All test manoeuvres were filmed with onboard GoPro cameras, ground cameras and documented with the DHV's data loggers. Test manoeuvres were performed by the DHV test pilots Simon Winkler and Harry Buntz at the top third of the weight range.

Asymmetric Collapses
What is tested:
Asymmetric collapses are conducted at trim speed and at full speed with no pilot action. Canopies are collapsed to the top limit of the field defined in the LTF airworthiness requirements (visible from the tapes stuck to the lower sail), i.e. the maximum possible for certified gliders. During LTF testing it is also possible to certify a glider collapsed at the minimum limit of the LTF field, but this generally results in less dynamic behavior. For this reason we often see differing results here in safety testing, when compared with those of the certification tests.
Note: Paragliders in the LTF B certification class are permitted to pitch forward to 45° after collapsing. This test regulation is verified in LTF testing using only video film shot from the ground and therefore subject to large error margins, as no clear reference points can be used to calibrate the measurements in any way. When a glider collapses asymmetrically, the dive experienced is always a combination of pitching forward and rolling to one side. This again makes judging the pitch forward angle from video film very imprecise. The data loggers used by the DHV record pitching and rolling movements separately. It has been determined that only a few gliders in the LTF A and B classes actually fulfill the test requirements of diving forward to less than 45° when measured with the data loggers.

In this test the **Eazy** from **Airdesign** and **Gradient's Bright 5** had the most benign reactions. The Czech glider reacts generally a little more dynamically, especially on pitch forward dives when recovering from extreme collapses. If this occurs, then a collapse on the opposite wingtip may follow, but without any great course change. Height loss during this manoeuvre was normal for the A-class, and between 30-40 meters. **Swing's Discus** requires a few meters more to recover from extreme accelerated collapses, and shows a tendency for collapses on the opposite wingtip but with no significant course change. Total course change for the manoeuvre was somewhat more than for the other A-class gliders in the test.
Compared with previous models, **Nova's** new **Ion 3** is a little more challenging to handle after extreme collapses. The glider begins to turn slowly, but then accelerates and pitches forward markedly.
Sky Paraglider's Atis 4 reacts quite differently. The canopy generally looses a lot of its wing area on a collapse which results in a very rapid turn. This increased twist danger was also accompanied with large pitch forward dives. To determine if this marked dynamic behavior could also lead to further complications such as cravats, the manoeuvre was repeated 10 times by our test pilots. These repeat tests indicated that the initial dynamic reactions then rapidly died down, and recovery was within the normal 50 meters height loss range for its class. Nevertheless, the initial dynamics and increased twist danger must be viewed critically.
UP's Kantega XC 2 has two faces. Collapses at trim speed are unspectacular regarding height loss and rates of course change. When collapsed while accelerated, the glider turns rapidly and dives markedly forward. Again, the dynamics and increased twist danger must be viewed critically for this glider. The glider also demonstrated a repeatable tendency for collapses on the oposite wingtip with cravats.
The **Gin Carrera** LTF-B classification with regard to collapses is difficult to comprehend. The canopy begins to turn dynamically, but not to the high degree of the Atis 4. The following dive forward angular speeds (in degrees per second) are then unusually high. Trim speed collapses demonstrated these dynamic reactions, and were often accompanied by collapses on the opposite wingtip and cravats. Test pilot input was then

required to prevent a follow-on spiral dive due to the cravat. Interestingly, accelerated collapses were somewhat less challenging and had fewer cravat problems. The glider requires a pilot with the skills necessary to immediately minimize the follow-on reactions of a large asymmetric collapse.

Airdesign Eazy M: Reacts relatively well to extreme collapses with large wing area lossage.

Swing Discus M: Large high wing area collapses can result in marked pitch forward diving with follow-on collapses on the opposite wingtip but no course change.

Gradient Bright 5 M: Extreme high wing area collapses can produce marked pitch forward diving with opposing collapses but no course change on this glider.

Sky Paragliders Atis 4: At trim speed it was difficult to collapse the glider in the measurement field (top left), and reactions were unspectacular. When accelerated, the glider collapses massively (top right, bottom left) and due to the rapid course change speed, pilots must actively prevent twists from occurring (bottom right).

Nova Ion 3 M: The importance of the collapse line angle or wing area loss can be clearly seen from these three pictures: from left to right the collapse line angle to the leading edge increases, more of the trailing edge is included in the collapse and the loss of wing area becomes greater. Reactions to collapses at low collapse line angles (left) are moderate, whereas collapses at high angles (right) are far more dynamic with marked pitch forward dives and height losses up to 50 m.

UP Kantega XC 2 M: At trim speed it was difficult to collapse the glider in the measurement field (top left). Glider reactions were normal for its classification. Accelerated collapses produce much higher wing area losses (top right) and have challenging recovery behavior; marked pitch forward diving, massive opposing collapses (bottom left), at times with cravats (bottom right).

Gin Gliders Carrera S: Glider reactions are more dependant on the collapse line angle that the speed at which the manoeuvre is performed. At lower collapse line angles (top left) the glider dives markedly forward and may collapse on the opposite wingtip with a small cravat. Collapses with large wing area loss (top right) are followed by very marked pitch forward dives, massive opposing collapses and cravats on both sides. (Mid right and bottom photos). Not every collapse ended in a cravat, but cravat tendencies were clearly recognizable.

Asymmetric Collapses							
Glider	**Height-loss in m**	**Pitch-angle in °**	**Pitch change rate in °/sec**	**G-Force in G**	**Course-change angle in °**	**V/sink maximum in m/s**	**Notes**
LTF A							
Swing Discus M	30-39 m 40-49 m²	-60° -75°[2]	-75° >75°[2]	2,6 G	-180° -360°[2]	15-20 m/s	Massive collapses[2] result in marked pitch forward dives with collapses on the opposite wingtip, but without course changes. Height loss between 40-50 m, less for trim speed collapses. Recovery generally between 90-180°, total course change usually under 270°, at times 360°.
Airdesign Eazy M	30-39 m	-60°	-75°	2,3 G	180-270°	15-20 m/s	Height loss under 40 m even for large collapses. Recovery often within 180° course change, at times within 270°
Gradient Bright 5.26	30-39 m	-60° -75°[2]	-60° >75°[2]	2,1 G	90-180°	15-20 m/s	Trim speed and accelerated low wing area collapse reactions unspectacular with low dynamics. High wing area

							collapses[2] provoke rapid large pitch forward dives but with moderate height loss under 40 m. Course change under 180°.
LTF B							
Sky Paragliders Atis 4 M	40-49 m	-75°, teils >75°	-75°, massive collapses always >75°	2,5 G, occasionally more than 3 G	270°-360°	>20 m/s	Glider collapses with large wing area loss. Very rapid course change, marked pitch forward dive, lines often unloaded. Moderate height loss for the high dynamics, generally under 40 m (trim speed) or 50 m (accelerated). Course change generally under approx. 270°.
Nova Ion 3 S	40-49 m	-75°	-75° occasionally >75°[2]	2,3 G	-180°, occasionally up to 270°	15-20 m/s	Generally moderate course change rates, for collapses at the upper end of the measurement field[2] markedly more dynamic with relatively large and fast pitch forward dives. Course change generally between 180-270°, height loss (trim speed) under 40 m, accelerated under 50 m.
UP Kantega XC 2 M	40-49 m 50-59[2] m	-75°	generally >75°	2,5 G, occasionally more than 3 G	generally -180°, occasionally -270°	15-20 m/s	Massive collapses[2] have rapid course change rates and large pitch forward dives. Marked line unloading. Height loss (trim speed) under 40 m, accelerated over 50 m. Course change generally under 180°. Often opposing collapses with tendency to cravat and further course change. High G-forces.
Gin Gliders Carrera S	40-49 m 50-59[2] m, pilot recovery occasionally necessary	-75°	generally >75°	2,7 G, occasionally more	generally -180°, occasionally -270°	>20 m/s	Very dynamic. Glider rapidly dives forward. Trim speed and accelerated, opposing collapses with cravat tendencies, or reproducable cravats. Height loss (trim speed) under 50 m, accelerated generally more. High G-Forces.

Front collapses

What is tested:
Front collapses are performed at trim speed and at full speed in different configurations: firstly by collapsing to a depth of only 40% of canopy (marked with tapes on the lower sail), and then by collapsing the maximum that the gliders construction presents. Maximum front collapses on full bar generally exceed the LTF certification limits. From accident analysis and diverse video footage, we know that front collapses in practice often effect 100% of the canopy. Many gliders are certified at the minimum 40% limit without looking for construction weaknesses. We often see large deviations to certification behavior when gliders are tested at the upper limit.
Pilot action to recover is only performed when the glider does not self-recover.

For all LTF-A gliders tested here smaller front stalls of up to 40% of the wing area open quickly without marked pitching and height losses of under 30 m. **Gradient's Bright 5** and

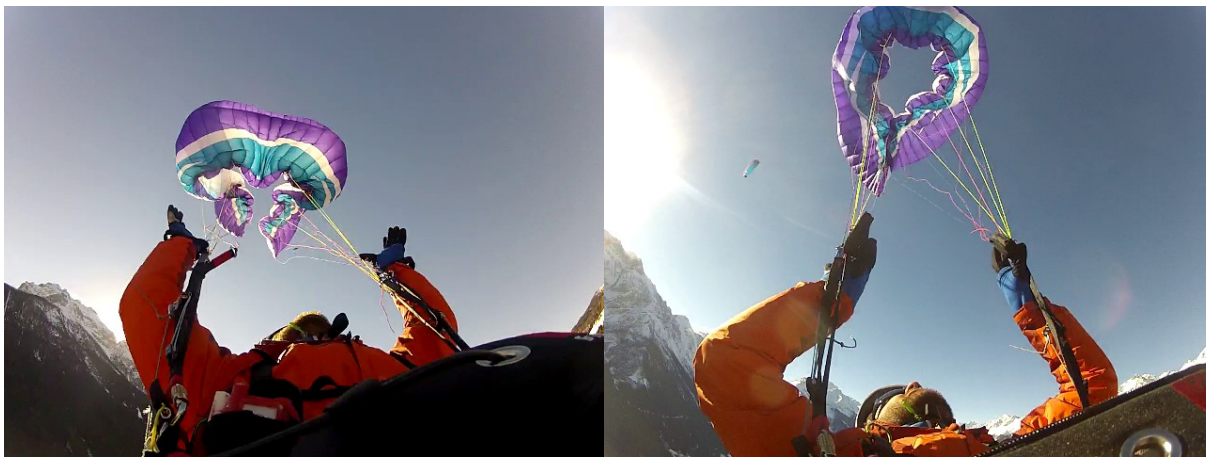
Swing's Discus also recovery well for larger front stalls. Occasionally both gliders do remain closed for longer periods which can lead to height losses of 40 m or more.

Airdesign's Eazy can also take a little longer to recover on occasion, especially from large front stalls, where the canopy first opens in the middle and the wingtips require longer to re-inflate. **Sky Paraglider's Atis 4** recovers with relatively low height loss for an LTF-B glider. Again, this canopy opens first in the middle, with the wingtip inflation being delayed. On a few very massive 100% front stalls the canopy did form a short front horseshoe. **Nova's Ion 3** performed much better than its predecessor, and showed almost no tendency to front horseshoe. Recovery was soft and slightly delayed, on occasion the leading edge stayed closed and recovery was moderately delayed. In this case the height loss was between 40-50 m.

As with asymmetric collapses **UP's Kantega XC 2** has two quite different reaction modes: recovery from smaller front stalls is unspectacular, but everything becomes rather more complicated if more than 50% of the wing area is collapsed. The glider then exhibits a marked delayed recovery, at times remaining in a stable front stall, deformation at the canopy middle leads to a front horseshoe with cravat tendencies requiring pilot action to recover from and prevent further height loss. **Gin's Carrera** was the most challenging glider tested here. The shark-nose leading edge suddenly collapses and disappears behind the pilot when the A-risers are pulled. Stall size and symmetry are difficult to control. The canopy has a marked tendency to dive forward on recovery which is dampened by the wingtips which remain collapsed to begin with. Even smaller front stalls are very dynamic, but height loss on recovery remains within normal limits for the LTF-B class.
Massive collapses are accompanied by very dynamic glider reactions. The canopy pitches back markedly and then re-inflates hard and spontaneously. The wingtips often cravat as the re-inflated center section of the wing overtakes them on recovery. Pilot action was usually required to recover from the cravats. A stable front stall did not occur.

Airdesign's Eazy reacts well even to large front collapses with low dynamics, but does tend to have a relatively large height loss remaining almost in a deep stall until the collapsed wingtips fully recover.

Gradient Bright 5: Both small and large collapses (left) open quickly or with minimal delay. Medium sized collapses (right) can remain stable for a few seconds with greater height losses (right). Here we can observe the lower sail closing the cell air intakes and delaying recovery.



Swing Discus: Sometimes a few seconds are required before the glider self-recovers (right). Generally, re-inflation is fast, but on occasion the wingtips remain collapsed.

Sky Paragliders Atis 4: No real problems with small or large front stalls. On occasion the canopy middle may deform but without horseshoeing or cravatting.

Nova Ion 3: Generally large front stalls open slightly delayed with the wingtips remaining collapsed. On occasion a slight tendency to a short stable front stall phase could be observed which then self-recovered (right). Cravats or marked tendencies to horseshoeing were not observed during the tests.

UP Kantega XC 2: Medium and large sized front stalls can recover quickly, but may also lead to a front hrseshoe (top right). The glider has a marked tendency to cravat, as the wingtips tangle in the upper gallery lines (lower left). Cravat recovery must generally be performed by the pilot (lower left).

Gin Carrera S: Medium sized front stall (top left) self-recover with collapsed wingtips (top right). Very large front collapses (mid left) can result in extreme dynamic reactions, e.g. forward dives requiring the pilot to use the entire brake range to recover from (mid right). Cravats of one or both wingtips often occur requiring immediate pilot action (lower left).

Front Collapse						
Glider	**Height-loss in m**	**Pitch-back angle in °**	**Pitch forward angle in °**	**Rotation, G-Force in G**	**V/sink maximum in m/s**	**Notes**
LTF A						
Airdesign Eazy M						
40% collapse	20-29 m	-30°	-30°	No	-10 m/s	Low pitch back, low pitch forward, generally fast symmetric self recovery.
Maximum collapse presented by construction	30-39 m, occasionally over 40 m	30-45°	-30°	Yes, occasionally >90°	10-14 m/s	Moderate pitch back, low pitch forward. Occasionally marked delayed recovery with collapsed wingtips and deep-stall phase before self recovery. Rotation possible.
Gradient Bright 5.26						
40% collapse	20-29 m	-30°	-30°	No	-10 m/s	Low pitch back, low pitch forward, generally fast symmetric self recovery.
Maximum collapse presented by construction	30-39 m, occasionally over 40 m	30-45°	30-45°	Yes, <90°	10-14 m/s	Generally fast recovery with only slight delay and collapsed wingtips, but on rare occasions also with longer delayed recovery and possible rotation.
Swing Discus M						
40% collapse	20-29 m	-30°	-30°	No	-10 m/s	Low pitch back, low pitch forward, generally fast symmetric self recovery.
Maximum collapse presented by construction	20-29 m[1] 30-39 m[3], occasionally over 40 m[2]	30-45°, occasionally 45-60°	45-60°[1] 30-45°[2,3]	Yes, <90°	10-14 m/s	Varied behavior: both fast impulsive recovery with marked pitch back and forward[1], and closed leading edge[2] or wingtips[3] with marked delayed recovery times.
LTF B						
Sky Paragliders Atis 4 M						
40% collapse	30-39 m	30-45°	30-45°	No	-10 m/s	Moderate pitch back, moderate pitch forward. Canopy middle opens fast, wingtips follow slightly delayed.
Maximum collapse presented by construction	30-39 m	30-45°, occasionally 45-60°	30-45°, occasionally 45-60°	Yes, < 90°	10-14 m/s	Depending on collapse size, moderate to marked pitch back and forwards. Generally the canopy opens fast in the middle, and the wingtips follow slightly delayed. Occasional tendency for the canopy to deform in the middle and front horseshoe. Height loss relatively low, even for larger collapses.
Nova Ion 3 S						
40% collapse	20-29 m	-30°	-30°	No	-10 m/s	Low pitch back, low pitch forward, generally fast symmetric self recovery.

Maximum collapse presented by construction	50-59 m	-30°	30-45°	Yes, occasionally > 90°	10-14 m/s	Delayed recovery with collapsed wingtips, on occasion markedly delayed with rotation tendencies and large height loss. Slight tendency for canopy deformation in middle, but no horseshoe.
UP Kantega XC 2 M						
40% collapse	30-39 m	-30°	30-45°	No	-10 m/s	Very stable at trim speed, collapses remain low area. Both fast and delayed recovery possible, low pitch forward.
Maximum collapse presented by construction	40-49 m[1] occasionally over 60 m pilot action required[2]	45-60°	30-45°	Yes, occasionally marked	10-14 m/s	Varied behavior, fast recovery with wingtip cravats, height loss under 50 m. Mid-sized collapsed occasionally stable with larger height losses. Often front horseshoes requiring pilot action[2].
Gin Gliders Carrera S						
40% collapse	30-39 m	30-45°	30-45°	No	-10 m/s	Canopy middle recovers quickly, wingtips remain collapsed and are slightly delayed.
Maximum collapse presented by construction	40-49 m occasionally pilot action required due to cravat	45-60°, occasionally more	30-45°, occasionally to 60°	Yes, <90°, but very dynamic	10-14 m/s	The greater the collapse area, the greater the associated dynamics. Occasional marked pitch back followed by impulsive recovery and marked pitch forward dives. Stable frontstalls did not occur in testing, marked cravat tendencies on recovering from large collapses.

Spiral dives

What is tested:
Spirals are flown such that after at least 5 seconds and before the 540° point the canopy is fully locked in a rotation. The testpilot then keeps the glider in the spiral using the brakes for a further 2 turns (720°) before releasing the inside brake to start recovery.

Airdesign's Eazy reacts rather dynamically for an LTF-A glider on entering a spiral. Sink velocities of nearly 20 m/s are reached after the second turn. Recovery characteristics are excellent – immediate exit with low height losses. **Swing's Discus** and **Gradient's Bright 5** are very similar in behavior; sink velocities around 15 m/s after the second turn, with exiting after a short acceleration phase and course changes of 180-270°. Exit behavior is somewhat challenging for the LTF-A class.
Sky Paraglider's Atis 4 is well behaved in spiral dives. Moderate sink velocities, no strong acceleration surges on exiting and rapid recovery to normal flight. Very similar behavior is exhibited by **Nova's Ion 3** and **UP's Kantega XC2**. Recovery is even slightly better than the Atis 4.
Of all the LTF-A and LTF-B gliders tested in the DHV Safety test series, **Gin's Carrera** exhibits the most challenging spiral behavior. Spiral dives are extremely dynamic in all phases from entry to exit (active pilot action always required). The canopy can enter a stable spiral with sink velocities over 20 m/s and g-forces between 5-6 g.

Spiral dives							
LTF A							
Glider	**Vsink after 360°, 720°,**	**G-Force after 360°,**	**Height loss after 360°, 720°,**	**Height loss from brake release to regaining**	**Time to 360° 720°**	**Action after brake release**	**Notes**

	max.	720°, max.	max.	normal flight			
Airdesign Eazy M	8 m/s 19 m/s 21 m/s	1,4 G 2,7 G 2,9 G	30 m 80 m	30 m	0-7 s 8-12 s	Short acceleration form 19-21 m/s then exit and self recovery within the next 180°	Entry and transition to spiral phase dynamic with rapid increase in Vsink. Exit easy.
Swing Discus M	7 m/s 15 m/s 19 m/s	1,7 G 2,6 G 3,5 G	30 m 80 m	60 m	0-7 s 8-11 s	Acceleration from 15-19 m/s for 180° then exit and self recovery within the next 180°	Entry and transition to spiral phase somewhat dynamic. Self recovery slightly delayed.
Gradient Bright 5.26	7 m/s 16 m/s 19 m/s	2,4 G 3,0 G 3,8 G	30 m 80 m	70 m	0-7 s 8-11 s	Acceleration from 16-19m/s, then constant sink rate > 17 m/s for the next 270° then exit and self recovery within the next 180°	Entry and transition to spiral phase moderately dynamic. Exiting relatively challenging due to constant sink rate for 270°
LTF B							
Sky Paragliders Atis 4 M	7 m/s 14 m/s 17 m/s	1,8 G 3,2 G 3,4 G	30 m 70 m	40 m	0-6 s 7-10 s	Short acceleration from14-17 m/s for 90° then exit and self recovery within next 180°	Entry and transition to spiral phase moderately dynamic. Outer wingtip collapses. Easy exit. Rapid self recovery after short acceleration phase.
Nova Ion 3 S	7 m/s 14 m/s 17 m/s	2,1 G 2,8 G 3,3 G	30 m 60 m	30 m	0-8 s 8-11 s	Short acceleration from14-17 m/s for 90° then exit and self recovery within next 90°.	Entry and transition to spiral phase moderately dynamic. Easy exit. Rapid self recovery after short acceleration phase.
UP Kantega XC 2 M	6 m/s 13 m/s 17 m/s	2,0 G 3,3 G 3,4 G	30 m 50 m	30 m	0-7 s 8-11 s	Short acceleration from13-17 m/s for 90° then exit and self recovery within next 90°.	Entry and transition to spiral phase moderately dynamic. Outer wingtip collapses. Easy exit. Rapid self recovery after short acceleration phase.
Gin Gliders Carrera S	13 m/s >20 m/s >20 m/s	3,2 G 3,5 G 6 G	40 m 90 m	Pilot action required	0-6 s 7-10 s	Acceleration from 20 m/s to over 25 m/s then constant sink rate >20 m/s for >360°. Active pilot action required to recover.	Extremely dynamic and challenging in all phases. Very high g-forces. Active recovery with large brake inputs necessary. Careful entry necessary.

B-Stall

What is tested:
Pitch back behavior on entry, pitch forward behavior on exiting and sink velocities.
In particular we look at the canopy stability and tendencies to deform on longer B-Stalls (>10s) and any recovery problems.

All of the gliders tested in this series hat no real problems with B-line stalls. **Swing's Discus** is a little unstable during the stall phase, and tends to slowly deform such that the wingtips fall back behind. **Nova's Ion 3** displays a tendency to deform in the canopy middle on longer stalls. **Sky Paraglider's Atis 4** recovers slowly on exit and care should be taken to apply no brake during this recovery phase. In spite of their higher aspect

ratios, the top end gliders from **UP** and **Gin**, the **Kantega XC 2** and **Carrera**, had no problems with this manoeuvre as long as care was taken during entry.

B-Stall					
Glider	**Sink rate in stable B-stall. Deformation tendencies Rotation**	**Pitch back on entry / pitch forward on exit**	**Height loss on exit**	**Notes**	**Glider**
LTF A					
Airdesign Eazy M	8 m/s	No No	15°-30° 15°-30°	-20 m	Very stable sink phase, low pitching back and forward. Immediate recovery.
Swing Discus M	9 m/s	Slight No	30°-45° 15°-30°	-20 m	Relatively high pitch back on entry. Canopy deforms slightly to rear and is moderately unstable. Immediate recovery.
Gradient Bright 5.26	8,5 m/s	No No	15°-30° 15°-30°	-20 m	Stable sink phase, low pitching back and forward. Immediate recovery.
LTF B					
Sky Paragliders Atis 4 M	8,5 m/s	No No	30°-45° 15°-30°	-30 m	Relatively high pitch back on entry. Delayed recovery with short deep-stall phase. Low pitch forward.
Nova Ion 3 S	8 m/s	No No	15°-30° 30°-45°	-20 m	Generally stable sink phase, slight tendency to deform at canopy middle. Low pitch back, marked pitch forward. Immediate recovery.
UP Kantega XC 2 M	8,5 m/s	No No	15°-30° 15°-30°	-20 m	Stable sink phase, low pitching back and forward. Immediate recovery.
Gin Gliders Carrera S	7,5 m/s	No No	15°-30° 30°-45°	-20 m	Stable sink phase, low pitching back and forward. Immediate recovery.

Big Ears

What is tested:
Big ears at trim speed and at full speed. Glider sink and speed is measured. Any entry difficulties or deep stall tendencies on exiting from trim speed big ears are noted.

This manoeuvre was unproblematic with all gliders tested here with the exception of Gin's Carrera. Here the wingtips flap strongly and make for an unstable flight. Exiting requires pilot action, and wingtips often cravat requiring use of the stabilizer line or brakes to recover from.

Big Ears					
Glider	**Entry**	**Exit**	**Vsink (trim) Vsink (full)**	**Speed difference trim - full**	**Notes**
LTF A					
Airdesign Eazy M	Easy	Automatic, slightly delayed	3,5 m/s 4,5 m/s	Approx.3-5 km/h less than trim speed Approx. 3-5 km/h more than trim speed	Very easy, wingtips stable, no flapping, good sink velocity
Swing Discus M	Easy	Automatic	2,5 m/s 3,5 m/s	Approx. 3-5 km/h less than trim speed Approx. 3-5 km/h more than trim speed	Very easy, wingtips stable, no flapping
Gradient Bright 5.26	Easy	Automatic	2,5 m/s 3,5 m/s	Approx. 3-5 km/h less than trim speed Approx. 3-5 km/h more than trim speed	Very easy, wingtips stable, no flapping
LTF B					
Sky Paragliders Atis 4 M	Easy	Automatic,	3 m/s 4 m/s	Approx. 3 km/h less than trim speed Approx. 5 km/h more than trim speed	Very easy, wingtips stable, no flapping, good sink velocity
Nova Ion 3 S	Easy	Automatic, slightly delayed	3 m/s 4 m/s	Approx. 3-5 km/h less than trim speed Approx. 5 km/h more than trim speed	Very easy, wingtips stable, no flapping, good sink velocity
UP Kantega XC 2 M	Easy	Automatic, slightly delayed	2,5 m/s 4 m/s	Approx. trim speed Approx. 5-8 km/h more than trim speed	Wingtips flap at speed
Gin Gliders Carrera S	Easy	Not automatic. May cravat. Requires pilot action.	3,5 m/s 4-4,5 m/s	Approx. trim speed, Approx. 5-8 km/h more than trim speed	Wingtips flap constantly. Occasional cravat on exit. Unstable flight, glider rolls and yaws.

Control characteristics and stall point

Control characteristics					
Glider	**Dynamic**	**Moderately dynamic**	**Balanced**	**Slightly delayed**	**Damped**
Airdesign Eazy M		x	x		
Gradient Bright 5.26		x	x		
Swing Discus M			x	x	
UP Kantega XC 2 M			x	x	
Gin Gliders Carrera S	x	x			
Nova Ion 3 S		x	x		
Sky Paragliders Atis 4 M		x	x		

Stall point characteristics					
Glider	**Brake travel**	**Brake pressure increase**	**Stall point easy to recognise**	**Stall point reached after short warning**	**Stall point reached with no prior warning**
Swing Discus M	75 cm	Marked		**x**	
Gradient Bright 5.26	70 cm	Marked		**x**	
Airdesign Eazy M	75	Very marked	**x**		
Sky Paragliders Atis 4 M	65 cm	Very marked	**x**		
Nova Ion 3 S	80 cm	Very marked	**x**		
UP Kantega XC 2 M	60 cm	Noticeable		**x**	
Gin Gliders Carrera S	75 cm	Very marked	**x**		