

# **A S P E N 2**

**PILOT'S MANUAL**

**Please read this manual carefully and keep its instruction in mind when using your ASPEN2 paraglider**

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# 1. INTRODUCTION

Congratulations on buying a new GRADIENT ASPEN2 !

After three years of popular acclaim, excellent reviews and over 1200 Aspens sold world-wide, Gradient are replacing the Aspen with a new glider, The Aspen2, the next generation in the DHV 2 category.

Our target is clear. To create an even better glider that will satisfy a similar pilot sector, keeping the comfortable but dynamic flying characteristics of the original Aspen but increasing the already high performance and safety margins. This is our way for the Aspen2.

We believe that you will be very enthusiastic about your new glider in terms of its flight characteristics and construction.

ASPEN2 is an intermediate performance paraglider (DHV 2, correspond AFNOR category Performance) and therefore is meant for qualified pilots who hold pilot licence B. (CP+)

This manual provides information, which will help you fly safely and keep your wing in good condition. If after reading this booklet you have any further questions or uncertainties, please do not hesitate to contact our company or any authorised GRADIENT dealer and we will gladly answer all your questions.

We would also welcome feedback from you about your new ASPEN2.

# 2. DESCRIPTION OF PARAGLIDER

## 2.1. Technical description

- The ground plan is a slender elliptical shape with a slight positive contortion of the leading edge. This means that the "ears" (stabilo) of the canopy are slightly swept back in flight and this modern design gives a number of advantages.
- The Aspen2 has a new airfoil section to meet the requirements of an optimal balance between performance and stability. The airfoil's maximum relative thickness is 17 % and its characteristics were defined so as to deliver maximum stability over as wide a speed range as possible. These qualities are enhanced by the size and positioning of the cell openings as well as attention to the design of the break system.
- Special focus has been given to the position, area and shaping of the cell openings to ensure high stability over a very wide speed range (angle of attack). Graduated sized cell openings help to reduce the air movements and aid pressure distributions within the glider.

- For better distribution of force within the canopy, diagonal segmented-rib technology is used. The forces in the wing are carefully calculated and balanced to give a flawless sail presentation and an intuitive feel to the flying.
- The special three-level line concept with progressively differing diameters has the top-level lines made from a special, very strong dyneema DC of 0.7 mm diameter. All that lines have the advantage of splice loops giving maximum overall strength, durability and the lowest possible drag.
- ASPEN2 is supplied with a well-trying four-riser speed system with a working range of 16 cm.
- Gradient has paid attention to details too with new low drag micro attachment points on the wing tips and a new rucksack, inner bag and riser bag etc.

## 2.2 Technical data ASPEN2

Size	22	24	26	28	30
Area .....	22.15 m <sup>2</sup>	24.20 m <sup>2</sup>	26.36 m <sup>2</sup>	28.60 m <sup>2</sup>	31.53 m <sup>2</sup>
Span .....	11.23 m	11.57 m	12.25 m	12.76 m	13.40 m
Aspect ratio .....	5.69	5.69	5.69	5.69	5.69
Proj. surface area ....	19.51 m <sup>2</sup>	21.33 m <sup>2</sup>	23.22 m <sup>2</sup>	25.20 m <sup>2</sup>	27.78 m <sup>2</sup>
Proj. wingspan .....	9.45 m	9.88 m	10.31 m	10.74 m	11.28 m
Proj. aspect ratio .....	4.58	4.58	4.58	4.58	4.58
No. of cells .....	53	53	53	53	53
Max. chord .....	2.45 m	2.55 m	2.67 m	2.78 m	2.92 m
Min. chord .....	0.52 m	0.54 m	0.57 m	0.59 m	0.62 m
Line diameters .....	dyneema 0.6/0.7/1.0/1.1/1.3 // aramid 1.3/1.5/1.8 mm				
Max. line length (B) ...	6.84 m	7.15 m	7.46 m	7.77 m	8.16 m
Line suspension .....	324.3 m	339.0 m	353.8 m	368.5 m	386.9 m
Weight .....	4.8 kg	5.1 kg	5.4 kg	5.8 kg	6.1 kg
Min. take-off weight*...	65 kg	70 kg	80 kg	90 kg	105 kg
Max. take-off weight*...	75 kg	85 kg	100 kg	115 kg	130 kg
Certification .....	DHV 2	DHV 2	DHV 2	DHV 2	DHV 2
<i>Min. sink rate**</i> .....	<i>±1.0 m/s</i>	<i>±1.0 m/s</i>	<i>±1.0 m/s</i>	<i>±1.0 m/s</i>	<i>±1.0 m/s</i>
<i>Min. speed**</i> .....	<i>&lt;22 km/h</i>	<i>&lt;22 km/h</i>	<i>&lt;22 km/h</i>	<i>&lt;22 km/h</i>	<i>&lt;22 km/h</i>
<i>Max. speed**</i> .....	<i>50+ km/h</i>	<i>50+ km/h</i>	<i>50+ km/h</i>	<i>50+ km/h</i>	<i>50+ km/h</i>
<i>Gliding ratio**</i> .....	<i>8.5+</i>	<i>8.5+</i>	<i>8.5+</i>	<i>8.5+</i>	<i>8.5+</i>

\* Pilot weight is the weight of the pilot including equipment and paraglider (18 – 25 kg)

\*\* The performance data are purposely for information only and by no means should serve for comparing to the other wings (!)

## 2.3. Specifications of materials

### Canopy

Upper Sail .....	Porcher Marine SKYTEX 9092 E85A-Evolution, 45 g/m <sup>2</sup>
Bottom Sail .....	Porcher Marine SKYTEX 9017 E38A-Classic, 40 g/m <sup>2</sup>
Ribs .....	Porcher Marine SKYTEX 9092 E29A, Hard finish, 45 g/m <sup>2</sup>
Reinforcements ...	Scrim F 02 420 X15A, 180 g/m <sup>2</sup> ; Dacron 160 g/m <sup>2</sup>

### Suspension system

Lines .....	LIROS Dyneema DC 60 / Ø 0.6 mm - strength 68 daN
	LIROS Dyneema DC 100 / Ø 0.7 mm - strength 99 daN
	Edelrid Dyneema 7850-080 / Ø1.0 mm - strength 92 daN
	Edelrid Dyneema 7850-100 / Ø 1.1 mm - strength 125 daN
	Edelrid Dyneema 7850-130 / Ø 1.3 mm - strength 136 daN
	Edelrid Aramid 7343-140 / Ø1.3 mm - strength min.140 daN
	Edelrid Aramid 7343-190/ Ø1.5 mm - strength min. 190 daN
	Edelrid Aramid 7343-230/ Ø1.8 mm - strength min. 230 daN
Risers .....	Techni Sangles PAD 1.6 / 22 mm
Pulleys .....	AustriAlpin Parafly, Riley
Carabiners .....	Maillon Rapide Ø 3.5 mm

## 3. CERTIFICATION

The ASPEN2 have in all sizes a German certification (Gütesiegel) DHV in the category 2.

The DHV certificate of each ASPEN2 is to be found on the rib in the middle of canopy. The certification is valid for all harnesses of ABS type. This type of harnesses enables a certain degree of adjustment to be made to the length of the waist strap. 42 cm is the recommended distance between the carabiners.

The following point applies to the ASPEN2 in common with all other paragliders: When loosened cross-bracing is used the pilot's weight shift control is greater and the glider is also more sensitive to the movements in the surrounding air. When the cross-bracings are tighter, the pilot feels subjectively more stable but turning by weight-shifting is practically ineffective.

**NOTICE: *Paraglider ASPEN2 is constructed for hill or tow launches. Use of subsidiary motor has not been tested for by the manufacturer or by the DHV!***

***THIS GLIDER IS NOT MEANT FOR JUMPING FROM  
A PLANE, BALLOON OR FOR JUMPS  
WITH A DELAYED OPENING OF THE CANOPY !***

## 4. ADJUSTING YOUR GLIDER

Every ASPEN2, before it is given to a customer, has a final check-up and test-flight to verify that its characteristics and measurements correspond to the manufacturer's specifications. You may only make adjustments to the break line lengths or to the speed system of your ASPEN2 and only then in keeping with the recommendations of this manual. Other adjustments or changes to your ASPEN2 lead to a loss of guarantee, airworthiness and validity of the Gütesiegel DHV - and so you endanger yourself and others.

If you do have any suggestions on improvements let us know and our test-pilots will try out your ideas without risk for yourself.

### 4.1. Brake line adjustment

When you receive your new ASPEN2, the brake line-length is adjusted to the middle length. This length should suit most pilots and is indicated on the main control line. It is of course possible **to adjust the break line length to suit each pilot's physical build, height of harness hang points, or style of flying.**

We recommend that you act wisely when adjusting break line length. Break lines that are too short may

- 1) lead to fatigue from flying with your hands in an unnatural position,
- 2) impede recovery from certain unstable manoeuvres and
- 3) will certainly reduce your glider's speed range.

Brakes that are too long will

- a) hamper pilot control during launch,
- b) reduce control in extreme flying situations and
- c) make it difficult to execute a good flare when landing.

Each break line should be tied securely to its control handle. Only use suitable knots e.g. dragon's knot, etc.

### 4.2. Addition of speed system

ASPEN2 is equipped with a foot operated speed system as standard. Pressure on the foot stirrup shortens the A, B and C risers and by this, reduces the angle of attack of the canopy. The working range of the speed system pulleys is 16 cm. Make sure you can utilise the whole of this range when you attach your speed stirrup. For some pilots this will require the use of a two-step speed stirrup.

## **5. FLIGHT OPERATIONS**

**This manual is intended as a guide to the characteristic features of your new ASPEN2 paraglider. Under no circumstances should it be used as a "learn-to-fly" manual for paragliding or as a substitute for a paragliding pilot's training course.**

### **5.1 Standard flight regime**

#### **5.1.1 Pre-flight check**

A thorough pre-flight check is essential for safe flying and that's why you should pay special attention to it. Above all you should check that the canopy, lines and risers are free from damage and tangles. Also don't forget about your harness and your reserve parachute.

**Before the launch spread the canopy out into a slight arc and check that:**

- all cell openings are free
- no lines are looped around or under the canopy
- no lines are tangled or have a knot in them
- any twigs, grass or other objects are not entangled in the lines or the canopy
- risers are not twisted
- control lines run freely through the pulleys
- knots on control handles are secure
- carabiners on risers are tightened

#### **5.1.2 Launch**

Launching the ASPEN2 is straight forward, either by front launch or by reverse launch. A dynamic pull of the front risers (A) will bring the canopy simply and easily above the pilot's head. The canopy inflates from the centre equally and fluently. ASPEN2 has no tendencies to outrun the pilot and quickly stabilises above the pilot. Don't forget about visually checking the canopy and its lines before the actual launch! Take off can be made easier by a light pull on the brakes.

#### **5.1.3 Flight**

When the brakes are loose, ASPEN2 is trimmed to fly at best glide angle. The best sink rate is produced with both the control lines drawn down evenly to about 20%-25% of their range.

#### **Flying in turbulent conditions**

When flying through severe turbulence it is recommended that the canopy is stabilised by simultaneously applying a little brake to both sides. Flying with a little

brake applied will also help to prevent deflation and allow you to get more feedback from your glider about how the turbulent air influences the behaviour of your paraglider. Responding correctly to the paraglider's movements by means of the breaks and weight shift is known as "active flying". A pilot demonstrating good active flying skills will significantly reduce both the number and severity of collapses he or she experiences.

## **Turning**

The ASPEN2 is very comfortable and pleasant in turns. The handling characteristics are very responsive and accurate and demand no special habits or non-standard procedures. When developing the ASPEN2 special attention was devoted to the control forces required manoeuvring the paraglider. The result is that the break travel and force has been optimised. In flight the control forces are firm, responsive and precise and allow for a perfect communication between the pilot and the canopy. Break pressure is reassuringly progressive.

A harness with fairly loose cross-bracing facilitates turning. In an emergency (e.g. a broken control line) ASPEN2 can be manoeuvred by steering carefully with the rear risers or by weight shift.

## **Usage of speed system**

Maximum speed is one of the strong points of GRADIENT paragliders and the ASPEN2 is no exception. Not only has it got a very high maximum speed, but unlike some other paragliders the full speed range is useable. In spite of this exceptional stability at high speed don't forget that any collapse at full speed will be more severe than the same event experienced at normal trim speed. Always keep both hands on the controls when flying fast in turbulence and be ready to release the speed system immediately at the first signs of a collapse. Use the speed system very carefully or not at all at low altitude.

### **5.1.4 Landing**

Landing with ASPEN2 is very simple and without difficulties. On your first flights you may be surprised at just how well it glides. Take account of this when making your landing approach! Against a wind, at about 1m above the ground you may pull down the brakes all the way. Under zero wind conditions, or if forced to make an emergency landing down wind you may prefer to take a wrap of each control line so as to enable a stronger flare.

## 5.2. Rapid descent

Every pilot will sooner or later be in a position when he/she has to quickly decrease his/her altitude. This situation may come about as the result of a sudden and unexpected change in the weather, reaching cloudbase and not wishing to enter the disorientating cloud, or simply because you need to finish your flight quickly. If the landing approach takes place through strong thermals, it is often very difficult to finish your flight without a rapid descent method being employed. There are three main methods for achieving a rapid descent and they are: "Big ears", "B-stall" and "Spiral dive".

***Practise your pilot abilities for these special flight regimes only under the supervision of your instructor and with a reserve parachute, always pay attention to all aspects of security in flight.***

### 5.2.1 Big-ears

This is the easiest technique for a rapid descent. Depending on how much of the wing tip you deflate, 3 to 6 m/s sink rate can be achieved. While in big ears your sink rate and forward speed can be further increased by using the speed system. ASPEN2 can also be steered in big ears by means of weight-shift.

- **initiation:** Take hold of the outer A-lines on both sides as high as possible and pull them down (one side followed immediately by the other) fluently and hold them firmly. The effective area of the paraglider is reduced equally on both sides of the wing. The size of the deflated area depends on the number of lines pulled (one or two outer lines per side) and how deeply the lines are pulled down.

Be sure to pull both sides equally.

- **recovery:** Under normal circumstances ASPEN2 opens automatically when the A-lines are released. The opening may be accelerated by gentle repeated braking symmetrically on both sides (slightly "pumping" the breaks).

### 5.2.2 B-line stall

This flight technique is a very effective way of making a rapid descent. Depending on how much the B-risers are pulled down, the sink rate is between 5 and 10 m/s.

- **initiation:** Take hold of the B-risers at the top and smoothly pull them down until the canopy shows a span-wise crease where the B-lines attach to the sail. Your sink rate will increase considerably while your forward speed will decrease to practically zero. Don't be startled when the airflow over the top surface is detached and the canopy enters a parachutal stall without moving forward. It will soon stabilise above your head.

- **recovery:** On releasing the B-risers ASPEN2 automatically returns to normal flight without staying in deepstall (sackflug) or shooting in front of the pilot. Let go of the risers smoothly and symmetrically.

**Caution:** *If the B-risers are released unevenly the canopy could enter a turn on release from the B-stall. If the risers are released slowly and very unevenly it could start a spin.*

### 5.2.3 Spiral dive

The spiral dive is the most effective way of making a fast descent. Every pilot should be able to perform a spiral dive and one day you may need to. Always be aware of your altitude, which decreases very rapidly during a spiral dive. The sink rate reached in a spiral dive can be more than 15 m/s. During the spiral dive the pilot and glider will experience strong centrifugal forces: the overload could be more than 3 g (!) which is a great demand on the pilot. The glider is strained just as much!

- **initiation:** Smoothly pull on one brake so that the glider goes from a normal 360 turn into a steep turn and from there into a spiral dive. The transition into a spiral dive can be made easier by weight shifting to the inner side of the turn. Keep an eye on the tension of the control line all the time - reduced tension signals an overload of the glider and danger of falling into a negative spin.

- **recovery:** ASPEN2 recovers from a spiral automatically as soon as the brakes are released. Release them smoothly and always finish a spiral dive with safe altitude!

**Caution:** *be sure, that your position in the harness is neutral! Recovery from spiral dive could be delayed by weight shifting to the inner side of the turn!!!*

## 5.3 Special flight regimes

No matter what category of canopy you fly or what level of certification it has, in turbulence or in strong thermals you may experience all kinds of collapses.

ASPEN2 behaves comfortably in these situations. Indeed not only does ASPEN2 deal with extreme flight regimes automatically, but also offers an above average degree of safety. Even so, you must follow all safety rules when practising special flight operations and always pay attention to your altitude!

### **Before performing special flight regimes remember:**

- practise reserve deployment on the ground, in a simulator, so that reserve deployment is automatic and efficient.

- Rapid altitude loss and considerable rotational forces may develop during unstable manoeuvres. Take account of these factors in the context of reserve deployment!

### 5.3.1. Collapse of one side of the canopy

- **initiation:** Take hold of the outer A-lines on one side and pull them down smoothly. The wing tip will collapse downward forming a characteristic "big ear". The size of the ear depends on the depth to which the lines are pulled as well as the number of lines pulled down. You can stop any tendencies to turn by applying the opposite brake and by weight shifting onto the inflated side of the canopy.

- **recovery:** Under normal conditions ASPEN2 will re-inflate spontaneously when the pulled lines are released. The inflation time and loss of altitude can be reduced by suitable action of the pilot. To reduce the tendency to turn off course, apply weight-shift to the inflated side of the paraglider and apply a little brake to that side also. If the collapse remains then re-inflate the collapsed side by "pumping" the brake on the collapsed side to quicken the inflation.

### 5.3.2. Frontal collapse of canopy

- **initiation:** Take hold at the top of both A-risers and pull them down until the leading edge collapses.

- **recovery:** In normal conditions ASPEN2 recovers normal flight automatically as soon as the front risers are released. Applying the brakes on both sides simultaneously can assist in re-opening the paraglider.

### 5.3.3. Deep stall ("sackflug")

- **initiation:** Pull both brakes smoothly until the sink rate increase markedly and the forward speed reaches almost zero. The pull on the brakes should be controlled so that the canopy stays inflated and doesn't fall back into a full stall.

- **recovery:** ASPEN2 cannot stay in this regime of deep stall flight, so after the brakes are released the glider automatically returns into normal flight. If you need to, you may accelerate the recovery of the glider by one of two methods: Either you can pull both brakes intensely followed by a fast release of brakes or you can pull on the A-risers lightly.

**Caution:** *If you pull on the A-risers too intensely you may experience a frontal collapse of the leading edge.*

### 5.3.4 Full stall

- **initiation:** Take one or two wraps of the control lines and pull both of them down smoothly. Hold them down until the canopy falls behind the pilot and deforms into a characteristic crescent shape. Hold your hands firmly (press them against the seat) and be careful that you do not release the brakes prematurely or asymmetrically.

- **recovery:** ASPEN2 recovers from a full stall automatically after brakes are fluently released. During correct recovery from a full stall the ASPEN2 shows no extreme tendencies such as a strong surge in front of the pilot. In the case of the brakes being released prematurely or too quickly there is a possible tendency for the glider to surge ahead of the pilot. This can be corrected for by adequate braking on both-sides simultaneously.

**Caution:** *It is common that when brakes are released asymmetrically a massive asymmetrical collapse may arise followed by a tendency to enter a spin.*

### 5.3.5 Negative spin

- **initiation:** Slow down by braking to nearly minimum speed. Then pull a brake on one side all the way down while simultaneously releasing the brake on the other side. Because the stalled side falls back, the canopy suffers airflow separation over one half of the wing, which results in a spin, and a rapid loss of altitude.

- **recovery:** Under normal circumstances ASPEN2 is capable of recovering from a negative spin automatically when brakes are released.

**Caution:** *In general when there is a very fast or a long-lasting rotation and when the brakes are released too quickly, the canopy may shoot in front of the pilot followed by a massive asymmetrical collapse.*

**Warning:** *In all regimes where the airflow is separated there is always a rapid increase in sink rate and therefore a substantial loss of altitude.*

**And remember:** *A wrong manoeuvre at the wrong time may change a fairly easy situation into a dangerous problem and furthermore you are exposing your glider to forces which may damage it. So practise your pilot abilities for these special flight regimes only under the supervision of your instructor and with a reserve parachute!*

## 6. MAINTANENCE AND STORAGE

If you handle your glider with care and store it in a suitable place it can last you a very long time. On the other hand neglecting maintenance, bad storage and the use of unsuitable cleaning products can reduce the lifetime of your glider significantly or may even make a dangerous subject of it.

### You must keep to these rules:

- Choose a suitable area for your launches. Lines caught on roots or rocks lead to unnecessary strain on the attachment tabs during inflation. Snagging lines may rip the canopy tissue or damage lines.
- When landing, **never let the canopy fall on its leading edge** in front of the pilot. The effect of these forceful collisions and the sudden pressure increase can severely damage the air resistant coating of the canopy as well as weakening the ribs and seams.
- Protect the canopy from unnecessary strain. Inconsiderate handling of your glider, namely pulling it over grass, soil, sand or rocks, will significantly reduce its lifetime and increase its air-porosity.
- When preparing the paraglider for launch or when ground handling, be sure not to step on any of the lines or the canopy tissue.
- Don't tie any unnecessary knots in the lines. A packing method where special knots are made in the lines as used on parachutes and reserve parachutes is not suitable for packing the lines used on paragliders.
- Protect your canopy and lines from unnecessary exposure to sunlight. UV-rays can damage many parts of a paraglider.
- Try **not to pack your glider when wet**. If there's no other way then dry it as soon as possible but away from direct sunlight. **Be careful to avoid storing your canopy wet**, this is the most common reason for cloth degradation, which you can easily prevent.
- Don't let your glider come into contact with seawater. If it does, rinse (the lines, canopy and risers) with fresh water and dry before storing.
- After flight or when storing, always use the inner protection sack.
- When storing or during transport make sure your glider isn't exposed to temperatures higher than 50 degrees Celsius.

- Never let the glider come into contact with chemicals. Clean the paraglider with clean lukewarm water only.
- For long-term storage don't pack the glider too tightly and store it in a cold, dry and well-ventilated room.
- After tree or water landings always examine the glider carefully. If you suspect that the flight features of your paraglider have changed, contact the nearest authorised GRADIENT supplier as soon as possible.
- After 200 flying hours or after 2 years at the latest your ASPEN2 must be thoroughly checked and tested by the manufacturer.

## 7. REPAIRS

Only small repairs may be done by the user, which means repairs that don't change the airworthiness of the paraglider. Among these are fixing small tears (besides seams) up to 10 cm, changing damaged lines or the change of rubber line-fixation-rings on the small carabiners.

**When repairing your paraglider on your own keep to the following rules:**

- When repairing the sail use a self-adhesive patch specified for this purpose. With every ASPEN2 the manufacturer encloses an amount of self-adhesive repair tape which is enough for small repairs.
- The only admissible repairs done on lines are those where the damaged lines are changed for new ones, exclusively supplied by GRADIENT or one of our authorised dealers or service centres.

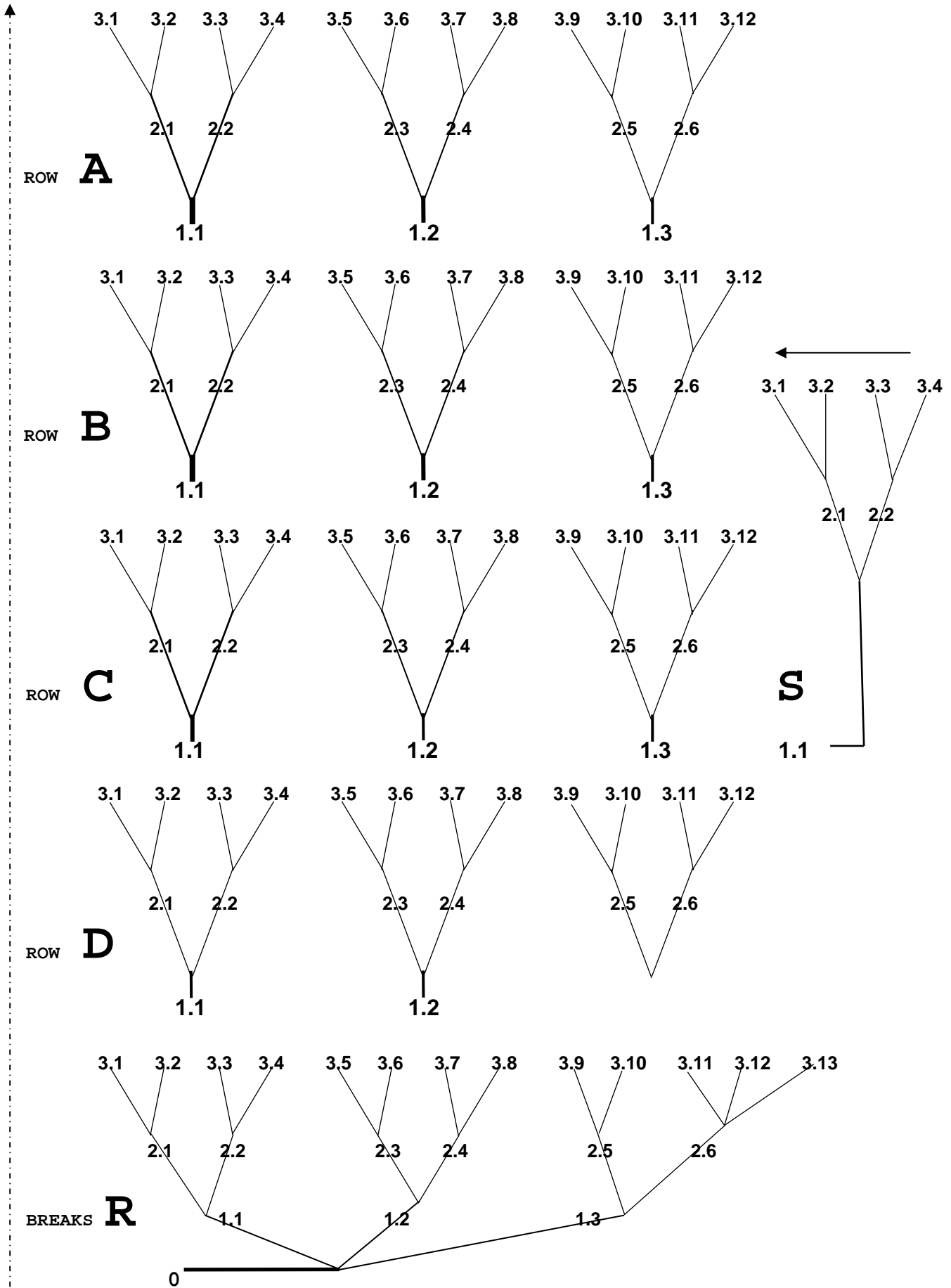
When putting an order for lines use the code indicators given in the diagram of suspension lines. Also give the indicator ASP2 (ASPEN2) and the size of the canopy of your glider, followed by the line code.

For example:

- the outside long line in row A for ASPEN2 28:       **ASP2 28 A 1.3**
- the front short stabilo-line for ASPEN2 26:       **ASP2 26 S 3.1**

# ASPEN 2 - system of suspension

MIDDLE OF  
THE CANOPY



- manufacturer encloses a spare line with every ASPEN2 with a prepared loop on one end. The right length should be adjusted according to the same line on the opposite side of the canopy and then attach your break handle. As soon as you can, swap the line for a new one from your authorised GRADIENT service centre.
- After changing any lines, a thorough pre-flight check must be done! Don't hesitate to ask your instructor or an experienced colleague for help. If you're not sure, entrust the job to an authorised GRADIENT dealer.
- If you have to replace any of the line-tidy rings (a spare ring is supplied with each ASPEN2), don't forget to check that the lines haven't swapped places accidentally and that they are returned to the small carabiner in the correct order.

## **8. CONCLUSION**

Even though ASPEN2 has outstanding performance and stability, it must be understood that even the safest paraglider is an aircraft and that all airsports can be relatively dangerous. Remember that your safety lies in your own hands and that "lucky pilots are well prepared pilots".

Never underestimate weather conditions and never forget that you are flying for pleasure and not to become a "fallen hero". Remember this and the fun that only free flying can bring will be yours.

We believe that your sensible attitude and the flight characteristics of your ASPEN2 will combine to give you lots of fantastic flying.

**GRADIENT wishes you many fabulous flights and happy landings.**

ONDŘEJ DUPAL

VÁCLAV SÝKORA