nucleon

user manual

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DUDEK paragliders

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NOTE!
Please read this manual carefully before your first flight

Important: Trimmer Tape Lock

On leaving the factory, paraglider risers are equipped with a plastic buckle blocking trimmer use. As such, the paraglider conforms to the EN norm.
However, if you want to get that additional angle of attack regulation, all you have to do is move the buckle toward black loop which pulls the trimmer in.

Remember still, the paraglider was NOT certified in any other configuration than fully closed trims.

All details concerning full trimmer range option can be found in the manual.

Plastic buckle allows you to restore the certified canopy version in any moment.

In order to move the buckle, you have to loosen the tape - see pictures:

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1. INTRODUCTION

CONGRATULATIONS

We are pleased to welcome you among the growing number of DUDEK PARAGLIDERS pilots. You've become a proud owner of state-of-the-art PPG paraglider. Extensive development, application of the most modern methods and thorough testing resulted in a friendly behaving paraglider, offering the pilot a lot of fun combined with great performance.

We wish you many enjoyable and safe flying hours.

DISCLAIMER

Please read this Manual carefully and note following details:

- The purpose of this Manual is to offer guidelines to the pilot using the paraglider and it is by no means intended to be used as a training manual for this or any other paraglider.
- You may only fly a paraglider when qualified to do so or when undergoing training at an accredited School or with an Instructor.
- Pilots are personally responsible for their own safety and their paraglider's airworthiness.
- The use of this paraglider is solely at the user's own risk! Neither the manufacturer nor dealer do accept any liability connected with this activity.
- This paraglider on delivery meets all the requirements of the EN 926-1 and 926-2 regulations or has an airworthiness certificate issued by the manufacturer. Any alterations to the paraglider will render its certificates invalid.

NOTE

Dudek Paragliders warns that due to constant process of development the actual paraglider may differ slightly from the one described in the manual.

2. THE WING

WHO SHOULD FLY Nucleon?

You have been paramotoring for some time now. You know and appreciate performance and safety of the reflex-aerofoil paragliders. Even if you are currently flying only for fun, long routes are attracting you no less than a wish to prove yourself against the best international competitors, or to beat some record. You are not afraid of strong thermals, and the agility tasks close to the ground look promising too.

What you need is a top-drawer paraglider; a canopy that will be safe and stable both at top and low speeds, with with efficient trimmers and speed system, as well as a precise steering, capable of quick reversing your paraglider. On top of that it has to be robust, so that high loads occurring at frequent PPG flying will not cause any deformations of the surface.

If most of the above statements do apply to you, then the Nucleon is your wing!

2.1 DESIGN

Nucleon is an Action and Reaction class paraglider, built around a new idea already proven in Synthesis and Plasma. The new concept assumes linear characteristics of acceleration (equally shared between trims and speed system) and limited reflexivity at slow trim settings. It is accompanied by a number of new design features, intensively tested since 2007 and introduced into mass production for the for the first time in the world. As a result we have a 100% reflex PPG paraglider with great performance and outstanding safety (comparable to the already legendary Reaction), featuring handling similar to classic paragliders (at low speeds). The Nucleon takes off perfectly, rising fast and clean after an easy inflation.

We are positively sure that the Nucleon is currently the best paraglider in its class.

The fundamental feature of a good PPG canopy is its great stability and tuck-resistance. When this is achieved, the user does not have to concentrate all the time on piloting in turbulent air, thus saving energy for navigation, taking pictures or simply enjoying the flight. In addition the faster and safer your paraglider is, the more often you can fly. While the Nucleon was designed to retain features of a classic paraglider, the application of a reflex aerofoil section added several new qualities. First of all, using that profile means that the wing stability does not depend exclusively on the pilot. It maintains a stable pitch attitude, rising and falling through thermals while remaining stable above your head, without need for so much pilot input. Generally speaking the reflex profile is a special kind of aerofoil section. The specific static pressure distribution creates a situation where at low attack angles, only the wing fore part (some 60% of the chord) is producing lift, while the rear 40% of the chord creates an effective stabiliser against

excessive decrease of the attack angle. The trimmer system allows for considerable raising the rear part of the airfoil, thus effectively reducing its projected chord and surface area by some 30%, giving the paraglider a higher wing loading and increasing its speed. The centre of pressure also moves forward, adding enhanced pitch stability. Such a shift of loading gives the Nucleon an exceptional tuck-resistance and increases its projected aspect ratio, resulting resulting in much better performance, especially at high speeds. Should you require more lift, the rear section can be pulled down to restore an airfoil that will be effective along its entire chord.

Below we will try to give you a closer look at some of the remarkable features of the Nucleon.

2.2 STRUCTURE

The Nucleon 3D body was designed in our **CSG** (Canopy Shape Guard) system, comprising many elements resulting in exceptional coherence and stability of the shape. Below you will find a short description of CSG subsystems.

Nucleon has an elliptical planform with slightly rearward swept tips. The cells are divided with ribs additionally supported by diagonal **VSS** (V-shaped supports) system. Such arrangement ensures a smooth top surface, exact aerofoil reproduction across the entire wingspan and yet more importantly, minimal number of suspension points.

The lower surface has a **RSS** (Reinforcing Strap System) applied in the wing's interior. RSS is an ballooning-independent reinforcements system, made entirely of paragliding fabric, stiffening and stabilizing entire canopy structure.

Nucleon' aerofoil is another product of our **DRA** (Dudek Reflex Airfoil) technology. It was calculated with our previous experiences in mind and thoroughly tested with numerical methods.

Properties of a reflex airfoil were described above. The suspension points areas are additionally reinforced with laminated fabric so that loads are equally distributed on three planes: vertically (through the ribs), diagonally through VSS system and level through the RSS.

All crossports have been prepared using **OCD** (Optimised Crossports Design) technology. Carefully designed shapes of the openings and their optimal placement between stress lines guarantee very efficient pressure distribution in the canopy and its quick inflation. These openings are scaled together with the ribs, so that their replicability is flawless and they do not disturb the aerofoil in any way. The Nucleon leading edge is closed to airflow, and its precise shape is guarded by reinforcements of laminated fabric.

Cell openings are positioned on the undersurface in the vicinity of the leading edge. Their exact placement was very carefully selected, so that they got maximum ram effect in as many flight situations as possible. In several places the leading edge features our **CCS** (Closed Cell Structure) system – this is a number of closed cells in most important locations. It's goal is to hinder the backflow from the cells out and thus to facilitate their reinflation and faster and canopy recovery in case of a collapse. On the wingtips we placed the **ACS** (Auto Cleaning Slots) - dedicated slots automatically removing dirt from inside the wing.

Careful selection of modern fabrics and design solutions brings about great strength and durability of the Nucleon. All materials used come from marked production batches, and each production step can be verified down to identification of specific worker and controller.

Fabric

Each kind of fabric has its unique features and characteristics. We composed them so that they create a perfect blend.

The upper surface is made of perfectly proven in our earlier wings of Porcher Skytex 40 Evolution fabric (formerly named Aquatic). Basically it's a nylon material, covered with outstanding E85A impregnate, introduced into mass production in January 2002 after a series of extensive laboratory and real flying tests. Such covered fabric is not very stiff and - what's most important - has increased tear, stretch and UV resistance. It is not siliconised, so minor repairs can be easily made with self-adhesive strips.

Lower surface is made of Skytex 40 Classic with E38A impregnate. This fabric has a great weight/resistance ratio and is one of the greatest Porcher successes in providing proper materials for the paragliding industry.

The ribs must be as rigid and stretch-resistant as possible. We found these qualities in Skytex 40 Hard with E29A impregnate. All suspension points and leading edge reinforcements are made of SR-Scrim fabric.

Rigging system

All of the Nucleon suspension lines are sheathed by a coloured polyester layer which is covering a brownish Technora core. Low number of lines required such composition, featuring high strength and stretch-resistance of the lines. The rigging system consists of individual lines looped and stitched at each end. The upper level lines start at the attachment points.Cascade-wise they are joined by twos or threes to middle layer lines. These in turn connect by twos or threes to main suspension lines, which are attached to the risers with triangular quick links (maillons). To prevent their slipping off, the lines are kept together with a rubber 'O ring'.

All the maillons are made of corrosion resistant, polished stainless steel, ensuring excellent strength and durability.

Stabilo lines run from the outer suspension points to the maillons through consecutive cascades as well. The same story goes for the steering lines. They run from the trailing edge through several layers to the main steering lines, which are lead through the pulleys connected to the rear risers and then fixed to the brake handles. Steering lines do not carry any load.

Some of the steering lines of the upper level are additionally led through rings sewn into the trailing edge, shortening it when the brake is applied, so that steering becomes lighter and more effective.

All the lines are distinguished by colours depending on their strength:

2,3 mm; strength: 420 daN; colour: celadon (willow green),
1,8 mm; strength: 280 daN; colour: red and orange (the latter for pulling big ears),
1,5 mm; strength: 190 daN; colour: violet,
1,3 mm; strength: 140 daN; colour: green,
1,2 mm; strength: 90 daN; colour: blue.

(given colours are subject to slight changes).

THE RISERS

For the Nucleon we have chosen four-way risers equipped with:

- **ELR** (Easy Launch Riser) system. This is an specially marked A riser (gold ribbon),
- speed-system affecting A, B and C risers when engaged, featuring ball-beared pulleys and special line;
- trimmers of red band with visible scale (red – slow and blue – fast trim setting), designed for quick and easy replacement in case of deterioration;
- two levels of the pulleys, to be used depending on the hangpoint level;
- ALC – allows for aggressive turns even on full speed, without modifications of the reflex profile. The steering handle is a red ball, easy positioned to match personal preferences and hangpoints.
- TEA -Torque Effect Adjuster – allowing for eliminating the effect of engine torque, tending to turn the paraglider in the direction opposite to the propeller's rotation. The system can be adjusted to match your specific combination of paramotor/propeller.

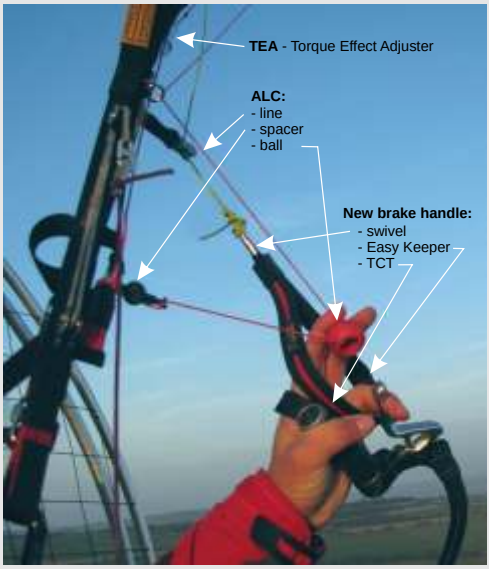
For quick and easy recognition in emergency, some of the risers are distinguished with coloured band as follows:

A - gold (used for launching)
A' – black neoprene (used for big ears)
B - red (used for B-stall)

ALC Alternative Steering System

ALC allows for aggressive turns even on full speed, without modifications of the reflex profile.

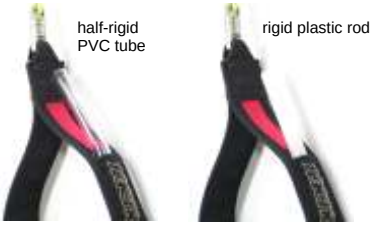
This is of special importance for bigger canopy sizes, without special solutions demonstrating problems associated with big steering forces and low agility. The steering handle here is the red ball, easily adjusted to match personal preferences. Of course you can use just the standard brake handles ignoring the ALC ball, thus leaving the system inactive.



Easy Catch

"Easy Catch" speedbar is a godsend for those who have problems catching the bar after taking off. The speedbar is designed to stay always in front of the speedsystem lines. Its finish is very robust, so long-term service is guaranteed.

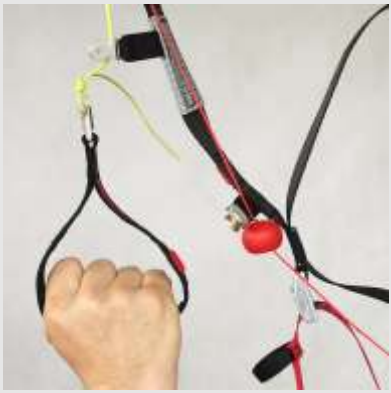
Triple Comfort Toggle



The most soft handle is obtained when no insertion is used.

Addressing different needs of our clients we have created a TCT system - Triple Comfort Toggle, making it possible to have your brake handles in rigid, half-rigid or soft configuration without need to purchase additional handles.

Easy Keeper



Easy Keeper is our indigenous way to hold the brake handles at the risers by using strong neodymium magnets. It keeps the handles firmly at the risers, while both attaching and releasing goes smoothly and easily. The system allows for easy placing the brake handles on risers during flight, when they are not used, thus minimalizing danger of getting them into running propeller.

D - grey (needed to keep the glider down in strong wind – aborted launch).

Main A row suspension lines connect to an A riser (gold) and A' (black neoprene). B row and stabiliser lines go to B riser (red), C lines go to C riser (no colour) and D lines to D riser (grey), as well as steering lines (through their pulleys).
Brake handles are attached to the steering lines at optimal point, guaranteeing safe and effective operation. On the main brake line there are two point marked, higher and lower, to be used depending on the harness hangpoint level.
On adjusting the steering lines see chapter 3.1.

Our newest brake handle used in Nucleon besides its attractive, light design, features:

- a swivel – preventing possible twisting of the steering line,
- TCT (Triple Comfort Toggle) system,
- EK (Easy Keeper) system – see further pages

3. FLIGHT OPERATION

3.1 STEERING LINES AND SPEED SYSTEM ADJUSTMENT

We strongly advise following actions to be supported by an instructor or at least an experienced pilot. A brand-new Nucleon has its steering lines and ALC system positioned for powered flight in high hangpoint configuration.

The risers of the Nucleon are shorter than in most paragliders, so the differences in hangpoints present somewhat smaller problem. Still, there are two sets of pulleys prepared, higher and lower (see risers scheme). Also on the main steering line and ALC system line there are two spots marked - higher and lower, for the brake handle and the ball to be accordingly fixed.

NOTE:Before flying the paraglider please check setting of brakes and ALC system and adjust it to your hangpoints if necessary.

When flying with lower hangpoints (or free-flying) the brake lines are to be run through the higher pulleys only, and the brake handles and the balls should be placed on higher marks of the steering lines, so that they will be shortened.

Higher hangpoints require longer steering lines and the ALC, while lower hangpoints – shorter lines. Before you will take on powered flight it is recommended to try the setup out.Hang up the entire PPG unit with ropes, sit in the harness and have someone pull up the risers. You must make sure that in flight you will always be able to reach the brake handles, even if the

airflow blows them away. Being suspended in this way you have a perfect opportunity to adjust the speed system too. The speedbar should not be pulling pull its lines nor risers when not applied. Neither should it be too loose, for it could catch the propeller. An additional way to check the whole configuration out is to visit the take-off site in steady winds of 3-4 m/s. With the engine off, inflate the wing and take it up over your head. When it stabilises, check that the brakes are loose and do not pull the trailing edge. There should be a spare inch or so before they activate.

Remember that it is always safer to set the margin of play too big than too small. And, most importantly, the setting must always be symmetrical.

3.2 FREE FLYING

Although the Nucleon according to its design book is a fast PPG wing, , it behaves surprisingly well as a classic paraglider too and can be used as such without any modifications.

The essential difference between Nucleon and classic paragliders means that due to its increased tuck-resistance (both during start and flight) and greater speed range it can be safely flown in strong conditions too. Generally speaking the faster you fly, the safer is your flight.

3.2.1 TAKE-OFF

In case of **classic launch** we recommend that after laying out the wing all lines be taut, eliminating excessive play. The Nucleon is pulled up with A risers only. It is best done with closed trimmers (slow setting), in case of stronger wind you can free the trims a bit. Applying steady and equal pressure on both A risers move forward. The wing practically does not overshoot, so the front collapses that otherwise happen quite often at launches are rarely seen with Nucleon. Instead it kind of waits for you to catch up with it.

In case of **reverse launch** we also recommend trimmers to be set as described above. Due to lack of overshooting the take-off is easy, pilot has only to brake slightly before his turn. Reverse launches can be executed without any problems even in weak wind (1,5 m/s).

CAUTION During take-off it is important to keep the risers under pressure until almost airborne. Reflex profile used has an inherent tendency to increase the angle of attack. In effect, Nucleon can behind the pilot when not pulled up appropriately.

3.2.2 FLIGHT

The increased speed range of Nucleon may demand some attention in flight. Nevertheless, once you have mastered these additional assets, flying will become pure fun. Good handling will let you make best use of thermals,

and increased speed on transitions means that your presence in sinking air will be shorter. To avoid stalls when braking with slow trims setting (red area), their movement is restricted by the tape sewing (Note: it is possible to push the sewn tape through the buckle with both hands to replace it, but normal operation range is restricted by said place).

When the trims are fully opened (blue area) the wing becomes faster and stiffer, increasing its stability even more. The brake forces increase too, as well as the brake travel to the stall point. The radius and bank angle in turns grow proportionately to the growing brake forces. When the are set fast (or fully opened) and the wing is not flown near the ground, a switch to ALC steering is advised.

ALC system can be used in all speed system & trim configurations, also in combination with main steering handles.

Speed system use

Full application of the speed system increases flight speed by some 30%. In contrast to most paragliders it does not decrease wing stability, in fact the Nucleon seems to counter the turbulences even better.

Still, if you meet some serious trouble, it is advisable to release the speedbar. With application of the speed system the brake forces increase, and brake effectiveness decreases considerably.

At maximum speedbar and fully opened trims we strongly recommend steering with ALC system. Turns executed in this way will be slightly wider, but strength needed to initiate the turn will be smaller and there will be no decrease in speed. It is advised to use the speedsystem with fully or half opened trimmers. **Using speedbar with closed trims (red area) can lead to a frontstall.**

3.2.3 LANDING

With closed trimmers (red area) Nucleon lands like any other paraglider. The brake forces, initially low, are growing proportionally through all range, giving ample warnings before possible stalling. Still you should be careful when flying very slow, until fully familiar with brake operation.

When landing with trims set fast, above “0” point (blue area) slowing down can require more space than usual. The paraglider has a lot of kinetic energy and energy and careless application of brakes may even cause the wing to climb.

Most pilots get to know the wing relatively fast and quickly gain enough trust to fly it in stronger conditions than they ever did. Still, you should always be careful when flying low. Remember that Nucleon flies faster than ordinary paragliders and sometimes it can be of importance (e.g. when landing on a slope).

After landing in strong wind the paraglider can be safely put down with B risers, or with a strong pull on the rear D risers.

3.2.4 WINCHING

Nucleon was not designed for winching. As mentioned before, reflex profile used has an inherent tendency to increase the angle of attack. While in normal flight such a disposition makes it safer, it can be dangerous during winch start. Nevertheless, a lot of successful winches on Nucleon have been made.Experience shows that it should only be done with trims set at “0” or above (faster settings - blue areas).

To sum it up: winching can be done, but proper attention must be paid.

3.3 POWERED FLIGHTS

NOTE: Before each start it is necessary to have a thorough check of the paraglider,harness and power unit.

In powered flight most of the wing characteristics remain as described above (chapter 3.2). Still there is additional information needed, concerning power output, proper matching of the wing/engine/propeller etc. Dudek Paragliders cannot take responsibility for all possible combinations, but if you contact us we are always ready to help.

First flights

In order to get familiar with your wing we recommend flying with closed trimmers first (read area up to “0” position), because in this configuration Nucleon behaves as a classic wing. Flying like that try pulling the brakes some until you feel resistance, usually it will be at about 1/4 of the brake travel. Once you feel confident with your wing, you can start experimenting with faster trim settings and speed system. Learn to use all of the additional speed and safety of the Nucleon.

3.3.1 TAKE-OFF

Classic launch with no wind

Even when it seems that there is no wind at all, it is rarely so. Therefore always be careful in determining the conditions, since in PPG flying it is most important that the launch and initial climb are performed with a head wind (the danger of losing your airspeed while crossing the the wind gradient is greatly reduced). Special attention must be paid to trees, power lines and other obstacles, including the possibility of emerging rotors.

Paraglider preparation

Lay out the paraglider downwind of the power unit, with all suspension lines taut and pointing toward center of the power unit. The risers are to be laid on

the ground. Set the trimmers completely closed (see fig. 2). In conditions faster settings can be advised (blue areas). Make sure that you warm up the engine while standing windward of the wing. Stop the engine before clipping in the risers.

Now have a quick check if:

- the helmet is on and locked,
- the risers are clipped in the carabiners,
- the trimmers are properly set,
- nothing will get in propeller's way,
- speed system is running without problems,
- steering lines and handles are free and not twisted,
- the engine delivers full power,
- take off area is clear of obstacles and free to use.

When you are sure everything is OK, you can clip in the wing and execute launch as described in paragraph 3.2.1.a.

From now on you should steer the paraglider facing forward, without looking back over your shoulder (when the wing is low behind you, turning can cause some lines to get in the propeller). Still, possible fall on your back and damaging the propeller is dangerous (and costly!) so it should be avoided at any price, even that of some damaged lines!

During take-off, when you feel the strain on both risers to be equal, make sure the canopy is overhead, open up full power and lean back to counter the engine thrust, so that it can push you forward rather than towards the ground. The best option is not to use the brakes, allowing the paraglider to rise as it was laid out. If it starts to swerve from its course, just pull the opposite riser and run under the centre of the wing while preserving starting direction. If the wind suddenly drops, give a stronger pull on the risers. If the paraglider falls to one side or back too far to be lifted again - kill the engine, interrupt launch and check the conditions once again.

As the wing rises, the forces grow lighter and it should stabilise above your head without overshooting. This is the best moment to check if it is inflated well and the lines are not tangled, but do so neither stopping nor turning. Once you feel the forces on the risers decrease, run faster and let go of the risers. See if there is already any opposition on the brakes and, if necessary, use them to correct direction or to increase lift at take-off.

Remember:

- If the cage of your power unit is not stiff enough, the risers strained during launch can deform it to the extent of collision with the propeller. Before giving it full power, see that the cage does not catch any lines.
- Any brake operation (or steering inputs in general) should be smooth and gentle.

- Do not try to take off until you have your wing overhead. Hitting power before that can cause dangerous oscillations.
- Do not sit in the harness until you are sure you are flying!
- The faster the trim setting is, the more brake input is required to take off.
- The lower the hangpoints of your power unit are, the easier is the launch.

Reverse launch in strong wind

Reverse launch can be executed holding in one hand both A risers and one brake, with throttle and the second brake in the other hand. With a decent wind it is by far the best way. In weaker wind it is better to prepare a classic launch, as running backwards with an engine on your back is not an easy thing to do.

It is reasonable not to pull the wing up until you are really determined to launch, especially when it is clipped in.

Lay down the rolled paraglider with its trailing edge against the wind. Unfold the wing enough to find the risers and check that no lines are looped over the leading edge. Stretch the risers against the wind, separating the right and left one.

We suggest that you lay the risers in the same way as you will be turning during reverse launch, and place one riser over the other, with rear risers upmost. It should be done this way because once you clip in, the cage of your power unit will make turning on your own practically impossible. Now run the pre-launch checklist.

After warming up the engine put the power unit on, turn to face the wing, go to the risers and clip them in the appropriate carabiners. Pulling on the front and rear risers open the cells. It is a good idea to pull up the wing briefly in order to check that the lines are not tangled. Holding the risers, brakes and throttle as described above, pull the front risers and raise the canopy over your head.

On most occasions you won't have have to brake it, especially if the trimmers are set for fast flight (blue areas). Perhaps it does not agree with our experience, but when the trimmers are opened (set above "0"), Nucleon's reflex profile stabilises the wing and does not allow it to surge forward. It can even stay behind a little - in such case pull the brakes a little and the glider will come forward. Once you have it overhead, turn around, open the throttle and take off.

As with the classic launch, in this case too you have to find such combination of trimmers, brakes and throttle settings that will give you the best speed and rate of climb.

Remember:

- You are launching with your hands crossed. You have to really master this technique before trying it with a running engine on your back.
- Any brake operation (or steering inputs in general) should be smooth and gentle.
- Do not try to take off until you have your wing overhead. Hitting the gas pedal before that can cause dangerous oscillations.
- Do not sit in the harness until you are sure you are flying!
- The faster the trim setting is, the more brake input is required to take off.

When clipping in the crossed risers, you can find proper connection of the speed system particularly hard. Be careful not to confuse the risers!

Climbing

Once you took off safely, continue heading against the wind, using brakes to correct rate of climb. Do not try to climb too steeply - attempts to increase climb rate by pulling the brakes will have an adverse effect - due to the additional drag actual rate of climb will worsen, and with the throttle fully opened open even a stall can happen. In powered flight the Nucleon behaves more like an aeroplane than a paraglider, and it is good idea to regard it as such. If there are no obstacles present, it is by far safer (and more impressive for the spectators) to fly level for a while after take-off and gain some speed before converting it to height with a brief pull on the brakes. Another reason not to try climbing too steeply is the risk connected with engine failure at low altitude. Even as Nucleon in a steep climb does not stay behind as much as conventional paragliders do, the low speed is more likely to cause a stall. Besides, you should always be able to land safely in case of engine malfunction, so it's better not to take unnecessary chances and always fly with a safe margin of speed. Depending on the power unit geometry, it is possible that after take-off you will notice a propeller torque (turning moment). It will try to turn you around, so be counter-steer it with a brake or harness cross-bracing. In Nucleon there is our TEA system present, making possible to counter the torque in case there is no cross-bracing. To make TEA work properly you should assembly the line on proper side (as of propeller direction) and adjust the blocking knot accordingly to torque force. When climbing steeply with slow trim settings and high power output beware of the possibility of stall. Due to typical PPG feature - considerable vertical distance between thrust axis and wing chord - the range of safe power operation is closely connected to your skills and equipment.

Power-unit induced oscillations Certain configurations of engine weight, output and propeller diameter can cause serious oscillations, during which the pilot is being lifted to one side by the torque effect, swings down due to his weight, then is lifted again and so on.

To avoid this you can:

- change the throttle setting and/or
- adjust the cross bracing to counteract the torque, if there is one present and/or
- use the TEA, pulling down the knot through the tube, simultaneously blocking it in the slit and/or
- shift yourself to the other side of the harness and/or
- change the trimmer setting.

The best method is to fasten opposite cross-bracing, or apply some weight-shift. Such oscillations usually occur at full power - the greater the engine output and propeller diameter, the bigger the swings. In addition there are often too late or wrong pilot reactions, increasing the problem instead of solving it. In this case the safest way to deal with this question is to close the throttle and release the brakes.

Especially less-experienced pilots tend to overreact. This is called a pilot-induced oscillation, and proven solution is to leave the brakes alone.

3.3.2 LEVEL FLIGHT

Once you have gained safe height after take-off and wish to go for a route, you can turn onto the right direction, fully open the trimmers and let off the brakes. If the conditions are turbulent, it can look foolhardy, but this is the essential feature of the reflex profile - the faster you fly, the the safer your Nucleon is. That's why it’s truly possible to release the brakes and enjoy your flight.

CAUTION: Some pilots with previous free-flying experience may have a well-grounded habit of keeping the brakes slightly applied at all times. Such a technique, while quite reasonable on a free-flying wings as it allows for quick pilot reactions and decreases sink, is not advisable on reflex-profile paragliders. When you pull the brakes, the Nucleon profile loses its reflex characteristics (see next page).

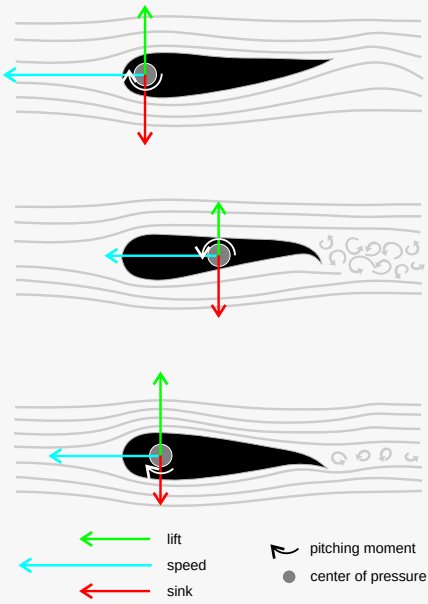
If you have a variometer or altimeter aboard – watch it. In level flight it is very easy to start climbing unintentionally. The instruments will help you optimise speed and fuel economy.

Of course each flight will depend on current configuration of your gear, but due to its ability to fly safe without constant piloting the Nucleon will let you adjust everything to the best effect.

Good knowledge of weather conditions (e.g. wind at different altitudes) and smart use of thermals, convergence or other kinds of lift will help you greatly reduce fuel consumption and increase flight range. Of course the engine is always there to bring you in the right place.

Influence of classic steering on the reflex profile

Pilots used to classic paragliders tend to fly "active" style, with their brakes constantly tensioned. Flying a reflex wing like that is ineffective and can possibly be dangerous.
Basic rule of reflex paramotoring says: ***the more turbulent it is, the more trims should be released and classic steering should be limited, especially with speed system engaged***.
In such moments paraglider is much more effectively steered by TST or ALC systems, designed specifically for that reason.
Problem is illustrated by following drawings:



Released trims without brakes
Typical setting for fast and safe flying. Center of pressure of the aerofoil moves forward, practically excluding collapses. Pitching moment induced by the reflex aerofoil increases angle of attack.

Released trims with brakes applied
Even slight brakes application (especially on full speed bar) shifts the center of pressure back, and due to lack of reflex on trailing edge, pitching moment now decreases angle of attack. Additionally turbulence behind the wing occurs. In some circumstances this can lead to a collapse. Using the brakes can be sometimes necessary for heading corrections, still you should keep your brakes free when flying ahead, otherwise the reflex feature doesn't work.

Closed trims
In this configuration brakes are the normal and prescribed steering system. Slow trim is used for launching in nil wind and thermalling. The canopy behaves similar to classic profile paragliders, with slightly increased tuck resistance.

Do not hesitate to lead the Nucleon into tight thermalling in order to win some altitude and spare fuel - you will be surprised how efficient it is. Possible closing the trimmers will make the climb ratio even better.

Trimmers and speed-system operation

The reflex wing airfoil enables the Nucleon pilot to use a wide range of trimmers and speed-system action. You are free to experiment with all possible settings, as long as you are on safe altitude. Fully opened trimmers (blue area) increase the speed and stability of the wing, and with it also its ability to cope with turbulences and overall penetration. As forces on the brakes grow at high speeds, the weightshifting or steering with ALC system becomes increasingly effective.

ALC system can be used in all trimmers and speed system settings, also

in combination with main steering handles. At maximum speedbar and fully opened trims we strongly recommend steering with ALC system. Turns executed in this way will be slightly wider, but strength needed to initiate the turn will be smaller and there will be no decrease in speed. **It is advised to use the speedsystem with fully or half opened trimmers.**

Using speedbar with closed trims (red area) can lead to a frontstall, especially in lower parts of start weight range). On the other hand, slow trimmer settings (red area) decreases sink and steering forces, so it is possible to efficiently use the thermals.

Worth noting is the Nucleon impressive speed range - the maximum speed is almost three times greater than stall speed.

Study drawings of trimmers and speed-system adjusting and setting, as well as their influence on the wing shape. Independent of the current wing configuration and speed, turns can be much tightened and more effective with differential brake operation. Slight use of the outer brake (with considerable amount of the inner one) will diminish the loss of lift in turn. Turns can be much improved by additional use of throttle, speed-system etc.

Once with growing experience you will master these techniques, you will be able to execute fully coordinated and effective turns, bringing to mind the aeroplane handling.

REMEMBER:

- Trimmer setting is another part of the pre-start check list!
- If it will be asymmetric, the wing will be turning all the time. And if you will inadvertently set them off, the reflex profile of the Nucleon will keep the wing level, so after opening the throttle you'll start to descend with increased speed instead of climbing.

3.3.3 LANDING

In PPG flying there are two kinds of landing: with and without power.

Power off landing

At an altitude of 50 metres switch the engine off and glide as you would on a conventional paraglider. It reduces the chances of damaging the propeller on landing, but on the other hand there is only one attempt possible - so it has to be done right! With or without power Nucleon better copes with turbulence on open trimmers (blue area). So, if the conditions are rough, better make an approach with greater speed, plan a lot of free space (as for a hangglider) and wear that speed off before touching down. Nucleon preserves the energy well, so there is a long float necessary, exchanging the abundant speed for lift with your brakes. If the landing field is not big enough and you have to land on the spot, we advise you to set the trimmers in red area. It will increase lift coefficient of the wing, effectively decreasing its sink rate and speed. Such an

action is especially important when flying with high surface loading.

Powered landing

Make a flat approach with the engine idling, then level out and lose the speed before final flare. Immediately after touchdown switch off the engine. The main advantage of this procedure is of course the possibility of a repeated approach if anything goes wrong. Still, if you forget to switch off the ignition before the wing falls down, there is a considerable risk of damaging propeller, catching lines in it or even suffering injuries connected with falling on your running engine.

Remember:

- Whenever possible, get to know the landing field before taking off.
- Check the wind direction before planning the approach.
- Landing with power off requires much less space.
- In case of any doubt, practice the landing until you feel totally safe.

3.3.4 GOLDEN RULES!

- Never place the power unit downwind of the paraglider.
- Check, double check and then check once again if there is no fuel leakage.
- Do you have enough fuel for the flight? It is always better to have toomuch than too little!
- Check if there is nothing loose in the harness, that could possibly contact the propeller in flight.
- Whenever you encounter a problem, fix it AT ONCE however small it is!
- Always put on and lock the helmet before getting in the harness.
- Before each launch run a full pre-flight inspection.
- After landing, control the wing facing the direction of flight, as on turning you always risk getting lines in the propeller. Turn only if there is danger of falling on your back.
- Do not ask for trouble - do not fly over water, between trees or power lines and other places where engine failure will leave you helpless.
- Mind the turbulence caused by other gliders or even by yourself, especially when flying low.
- It is not reasonable to let go of the brakes below 100 meters, because a possible power unit malfunction may require immediate attention.
- In general never trust your engine, as it can stop at any moment. Always fly as if it's exactly what it's going to do.

- Unless it is absolutely necessary (e.g. collision avoidance), do not execute tight turns against the torque direction. Especially when climbing you can easily enter a stall and consequent negative spin.
- Do not fly with tail wind at low altitudes, as it pretty much narrows your options !
- Do not wait for the problem to grow - any change of engine sound or a vibration can indicate troubles. You'll never know until you land and check it out!
- Be certain of your navigation
- Remember that not everyone is fond of your engine noise. Do not scare the animals.

3.4 QUICK DESCENT METHODS

3.4.1 BIG EARS

In order to get the big ears you have to pull down the outer lines of the A' risers (distinguished by neoprene sheath) by some 20-50 cm. While inducing big ears you should never let the brakes out of your hands.

After tucking the tips in, Nucleon will continue to fly straight with increased sink rate (up to 5 m/s). You can steer the wing pretty efficiently by weight-shifting. After releasing lines, the paraglider will usually open up on its own or you can assist it with a long stroke of the brakes. For the sake of safety (the possibility of a parachutal stall) it is reasonable to engage speed system after pulling big ears in order to lessen the angle of attack of the wing centre. Executing big ears with opened trimmers is very difficult due to reflex profile stabilisation.

CAUTION: See the PARACHUTAL STALL chapter.

Never try to pull big ears during powered climb, as the increased drag can lead to increase of the angle of attack and a parachutal stall.

Besides, pulling the ears while climbing is pointless anyway.

3.4.2 SPIRAL DIVE

Nucleon is a very agile paraglider, so entering spiral dive happens very quickly and can be surprising for the less experienced pilot. A spiral dive is characterised by reaching the highest sink rates possible. Significant G-forces, however, make it difficult to sustain a spiral dive for long, as will place high loads on both pilot and glider to degree of losing consciousness by the pilot. Never do this manoeuvre in turbulence or at too high bank angles. Control the dive and do not exceed 16 m/s sink. If the dive is not stopping after releasing the brake,assist the glider with the outer one.

NEVER DO BIG EARS IN A SPIRAL! In this manoeuvre smaller number of lines is carrying an excessive load mulitplied by the centrifugal force, what can lead to damage of the lines or even the paraglider itself (load of a single line can be much higher than passed in certification trials (i.e. 8 G).

3.4.3 B-STALL

Executing a B-stall on a Nucleon is very hard due to specific suspension lines location in stabilizers area.

To enter a B-stall, simultaneously pull down both B-risers (red tape) by 10 – 15 cm. The canopy will collapse across the entire span along its B-row, the airflow over top surface will break and canopy surface will be decreased. Forward movement will be almost completely stopped. Further pulling B-risers is not advised, as tests have shown it to increase wing instability. If the canopy forms a horseshoe with both wingtips in front of the pilot, gently apply both brakes to recover.

To exit a B-stall, the risers should be released in a smooth and decisive manner. On quick and symmetrical releasing B-lines the airflow will be reinstated and the wing will surge forward, returning to normal flight. In contrast to standard paragliders, in case of Nucleon there is no need to counter this surge with brakes - yet another asset of the reflex profile!

CAUTION: See the PARACHUTAL STALL chapter. All rapid descent techniques should be practiced in smooth air and only with sufficient altitude only ! Full stalls and spins are to be avoided as recovery procedures, of the extreme manoeuvres, since irrespective of paraglider type they may have dangerous consequences!

BY FAR THE BEST TECHNIQUE IS SAFE AND CORRECT FLYING, SO THAT YOU WILL NEVER NEED TO DESCEND RAPIDLY!

3.5 AEROBATICS

Nucleon was not designed to do any aerobatics.

3.5.1 WING OVER

You make a wingover by performing a series of consecutive, alternating turns with growing bank angle. Too much banking connected with some flaws in co-ordination and execution can evoke pretty dynamic collapse.

CAUTION: Steep turn with bank angle over 60 degrees is a prohibited aerobatic manoeuvre!

3.6 EXTREME MANOEUVRES

CAUTION!

EXTREME FLYING MANOEUVRES SHOULD ONLY BE CARRIED OUT DURING SAFETY TRAINING COURSES (SIV, INSTABILITY TRAINING)

UNDER PROPER GUIDANCE! WHILE PROVOKING OR EXITING REAL SITUATIONS THERE IS DANGER THAT YOUR ACTIONS WILL PROVE TOO QUICK OR TOO STRONG, SO YOU SHOULD ALWAYS EMPLOY GOOD JUDGMENT, STAY CALM AND TAKE MEASURED ACTIONS.

Since all actions required to exit or prevent dangerous situations on Nucleon are typical and pilots flying this wing should already have proper experience, we are going to describe only the characteristic features of the Nucleon. Description of standard methods dealing with extreme situations can be found in textbooks.

3.6.1 ONE SIDED COLLAPSE

Even when the trimmers are fully opened or the speed system is engaged, collapses practically do not occur and can be induced only by a very strong turbulence.Still, if it happens, a little counter-steering is enough to keep the Nucleon on course. Under normal conditions with collapses up to 50% of the wingspan, Nucleon will reinflate instantly and spontaneously. If it will not happen, you should aid this process by application of brake on the collapsed side.

3.6.2 FRONTAL COLLAPSE

The reflex profile of the Nucleon makes it practically impossible, especially at higher speeds.

During tests we succeeded in creating this situation only with fully closed trimmers and using special measures. Such forced collapses can lead to extremely deep collapses, so recovery will require decisive pilot action (short and equal application of both brakes).

3.6.3 FULL STALL AND NEGATIVE SPIN

Practically do not occur, may happen only as a result of serious neglect or intentional action of the pilot. You have to be careful when flying at low speeds until fully familiar with brake operation. Wing recovers spontaneously in initial phase of stall, otherwise use standard procedures.

3.6.4 DEEP STALL

Under normal conditions does not occur.

If you want to prevent it happen at all, simply stick to a couple of rules:

- after B-stall, release the risers quickly and evenly. Don’t be afraid - Nucleon does not jump forward excessively.
- after big ears execution, engage the speed system. This will increase both the sink rate and safety margin, as big ears constitute an aerodynamic brake with significant loss speed.

Nevertheless, if such a parachutal stall happens e.g. due to strong

turbulence, simply apply some pressure on speed bar and/or push the A risers forward. You can release the trims too.

3.6.5 LINE OVER AND CRAVATTE

Nucleon is a modern wing which, in order to decrease drag, has fewer suspension lines and greater distances between them. Therefore it's always possible that after a tuck one of the stabilisers may tangle in the lines. Usually a couple of pulls with a brake settles the matter.

If it's not enough, try to untangle it with big ears or a stronger pull on the risers.In case of any doubts you should seriously consider a rescue chute. It is there as a normal equipment part, not just an ornament.

3.6.6 EMERGENCY STEERING

In case of any malfunction that renders normal steering impossible, you can safely steer and land Nucleon using the D-risers (grey marking) or stabilo lines.

4. PARAGLIDER CARE

Proper looking after your paraglider will prolong life of your Nucleon.

4.1 STORAGE

Store the paraglider in a dry place, away from chemicals and UV exposure. Never pack or store the glider when wet, as it significantly shortens life of the fabric.
Remember that the wing becomes damp even while lying on green grass in direct sunlight, as the grass transpires.
A good precaution to avoid dampness and/or UV when you have to wait in a start queue is to use quick-pack after rigging up.
Always dry the glider thoroughly before packing and/or storage. Never pack you paraglider too tightly.
While drying, never expose your paraglider to direct sunlight operation.

Please note that with frequent kiting on a field or a small hill your paraglider will deteriorate more quickly due to its repeated rising, falling and being dragged around.

4.2 CLEANING

Clean the paraglider with water and a soft sponge. Do not use any chemicals or alcohol, as these can permanently damage the fabric.

4.3 REPAIRS

Repairs should only be carried out by the manufacturer, authorised distributor or authorised workshop. It is acceptable to fix minor cloth damage with the self-adhesive patches included in the package.

4.4 DETERIORATION: A FEW TIPS!

The Dudek Nucleon is made mainly of nylon - a fabric which, like any other synthetic material, deteriorates through excessive exposure to UV rays that come with the sunlight. Hence it is recommended to reduce UV exposure to a minimum by keeping the paraglider packed away when not in use. Even when packed in a bag, it should not remain in the sun for long.

Nucleon' suspension lines consist of Technora inner core and polyester sheath. Submitting them to excessive loads in flight should be avoided, as it can cause irreversible damage.

Keep the paraglider clean, since getting dust in the lines and fabric will reduce their durability.

Be careful to keep snow, sand or stones from entering the cell openings: their weight can slow or even stall the glider, and sharp edges can damage the cloth.

Prevent lines from catching anything, as they can overstretch or tear. Do not step on the lines.

Uncontrolled strong wind takeoffs or landings can result in the leading edge of the canopy hitting the ground hard, which may seriously damage the ribs, sewing and surface material.

Knots can chafe suspension and/or brake lines.

Check line lengths after tree or water landings, as they can stretch or shrink.

A line plan is included in this manual or may be obtained from the dealer when needed. After landing in water you should check the wing fabric as well, since the wave forces can cause the fabric to distort in some areas. When taking the wing out of the water, always do this by trailing edge, so that water can flow out freely. After a sea landing, rinse the paraglider with fresh water. Since salt crystals can weaken the suspension lines even after rinsing in fresh water, you should replace the lines with new ones immediately after contact with salt water.

Every second year Nucleon should undergo technical inspection by the manufacturer or authorised distributor.

5. TECHNICAL DATA

Nucleon	23	25	27	29	31	34
Certification EN	pending	EN C	EN C	EN C	EN C	EN C
Certificationt DULV	-	Advanced	Advanced	Advanced	-	-
Certification LTF	-	-	-	-	-	C
Number of cells	62	62	62	62	62	62
Surface area (flat) [m^2]	23,00	25,00	27,00	29,00	31,00	34,00
Surface area (projected) [m^2]	19,58	21,28	22,99	24,69	26,39	28,95
Span (flat) [m]	11,14	11,62	12,07	12,51	12,94	13,55
Span (projected) [m]	8,93	9,31	9,68	10,03	10,37	10,86
Aspect Ratio (flat)	5,40					
Aspect Ratio (projected)	4,07					
Sink rate [m/s]	min = 1,1; trim = 1,2 - 2,0; max = 3,0					
Speed [km/h]	min = 23; trim = 37 - 50; max = 62					
Max. cord [cm]	245,69	256,15	266,20	275,88	285,23	298,72
Min. cord [cm]	49,14	51,23	53,24	55,18	57,05	59,74
Distance pilot to wing [cm]	713,25	743,62	772,79	800,90	828,05	867,20
Total line lenght [m]	375,67	391,67	407,03	421,84	436,14	456,76
Weight range [kg]	65-80	75-95	90-110	100-130	120-145	140-175
Weight [kg]	6,3	6,6	6,9	7,3	7,8	8,2
Lines	Technora: 1,2 & 1,3 & 1,5 & 1,8 & 2,3					
Fabric	SkyTex Evolution 40 g/m^2					
	SkyTex Clasic 40 g/m^2					
	SkyTex Hard 40 g/m^2					
	SR Scrim, SR Laminate 180 g/m^2					
Risers	PASAMON - Bydgoszcz, Polska					

6. WARRANTY AND AEROCASCO

Purchase of a new paraglider is a serious expense for any pilot. That is why we cover our paragliders with extensive warranties and additionally offer an AeroCasco insurance against damage and repair costs.

WARRANTY

Dudek Paragliders guarantees free of charge repairs caused by the material or production faults along following scheme:

For the free-flying paragliders warranty covers **36 months** (3 years) or 300 flight hours (depending on what comes first).If the paraglider is used for powered flights, every hour spent in the air should be counted as two (does not apply to dedicated PPG canopies).

For the PPG paragliders warranty covers **24 months** (2 years)/200 flight hours (depending on what comes first).

For the mountaineering (MPG) and speedflying wings as well as school and profit users warranty covers **18 months** (1.5 year)/150 flight hours (depending on what comes first).

WARRANTY DOES NOT COVER:

- canopy colour fading
- damage caused by chemicals or salt water
- damage caused by incorrect use
- damage caused by emergency situations
- damage resulting from accidents (airborne or not)

WARRANTY IS ONLY VALID IF:

- flight hours are correctly registered in the logbook of the owner (and possible earlier owners), distinctly marking PPG flights,
- the paraglider is handled in accordance with the operating manual,
- the purchaser has not carried out any repair by him/herself (excl. minor repairs with self-adhesive patches),
- carried out any modifications,
- the paraglider can be unmistakably identified
- the paraglider was being inspected according to prescribed timetable.

If you have ought your paraglider second-hand, ask its previous owner of the paraglider for a logbooks copy (total of flying hours since the date of first purchase).

AEROCASCO

Normal warranty does not cover repairs of damages caused by the user or a third party. As costs of such repairs can be considerable, Dudek Paragliders offer an AeroCasco insurance. It covers a one-off repair of any mechanical damage, no matter how big and whoever inflicted them.The only expenses the purchaser has to pay are shipping costs and so-called share-of-cost amount.

AeroCasco can be purchased only for a brand new paraglider (at the paraglider purchase). Its cost is 50 euro.

NOTE: AeroCasco is not available for all paragliders (check this before purchase). It can be obtained for privately used wings only.

AeroCasco applies only to damages that took place during take-off, flight or landing. Obviously, all faults in the material and manufacturing flaws are covered by normal warranty.

When handing the paraglider for the repair you have to present a card confirming its AeroCasco status. After the repair you will have to cover only the share-of-cost value of 50 euro.

AeroCasco is valid for one repair only.There is a possibility to extend AeroCasco for one more year. To do this you have to send your paraglider for inspection not later than a year after the date of purchase. Extension fee is 75 euro (incl. inspection).

Remember to attach the AeroCasco confirmation on expedition.

AeroCasco does not apply to any of the following: theft, colour fading, damage caused by incorrect storage or transport, damage caused by chemicals, salt water and force majeure.

7. WHAT HAVE YOU BOUGHT

The Dudek paraglider that you bought should have the following items:

- the paraglider itself (canopy, lines and risers)
- transport bag (with compression strap)
- MotoBag - specialised double funcion backpack
- a speed system with Easy Catch bar
- a windsock
- a pocket with paper work and repair wallet including:
  - A piece of self-adhesive fabric (10 cm x 37.5 cm) for small repairs. Note that even small tears located in the vicinity of stitches have to be repaired by an authorised service
  - A looped and stitched suspension line longer than the longest line used in the paraglider that is to be used as a temporary replacement. Do not cut it if you have to replace a shorter line, just tie it at the length needed
  - A paraglider passport with entered date of purchase and valid technical inspection (please check the serial number with the sticker on the wing tip)
  - The User Manual you are reading
- Small gifts.

MotoBag

MotoBag is a dedicated solid backpack for PPG wings, made of proven Cordura fabric. Simultaneously it doubles as a quickpack if necessary.

Beside comfortable shoulder straps to hold it traditionally on your back it has side handles too, so that you can carry it like a suit-case when needed.

After turning it inside out it becomes a quickpack that will shelter your unfolded wing when you are in a hurry.

SUMMARY

If you respect the rules of safe flying and proper glider care, you will enjoy many years of pleasant airtime. Still, you must be aware of possible dangers and face them wisely. You must accept the fact that all air sports are potentially dangerous and your actual safety depends solely on you.

We insist that you fly safely, and this concerns both the weather choice and safety margin during all manoeuvres.

FLYING THE PARAGLIDER IS ALWAYS YOUR OWN RESPONSIBILITY.

SEE YOU IN THE AIR!

8. RIGGING TABLES AND SCHEME

Lengths are measured with a specialised, computer-operated device. All lines are stretched with a 5 kg load before cutting. Thanks to the abovementioned device and proper procedures, final tolerance of line lengths does not exceed 0.15%.

NOTE: Distances given below are to be understood as distances between connection points. When cutting a line for repair, 20 cm extra must be added, as at each end a 10 cm stitch is required to fix the loop. The only exception is the main steering line (brmain), which is looped only at the upper end, while there is 20 cm left on the lower end for fastening brake handle (this means for this line extra 30 cm is needed).

Length of the steering line is given as for PPG high suspension harness (=longer lines). In case of a low suspension harness, the steering line should be some 15 cm shorter (the point is higher on the line).

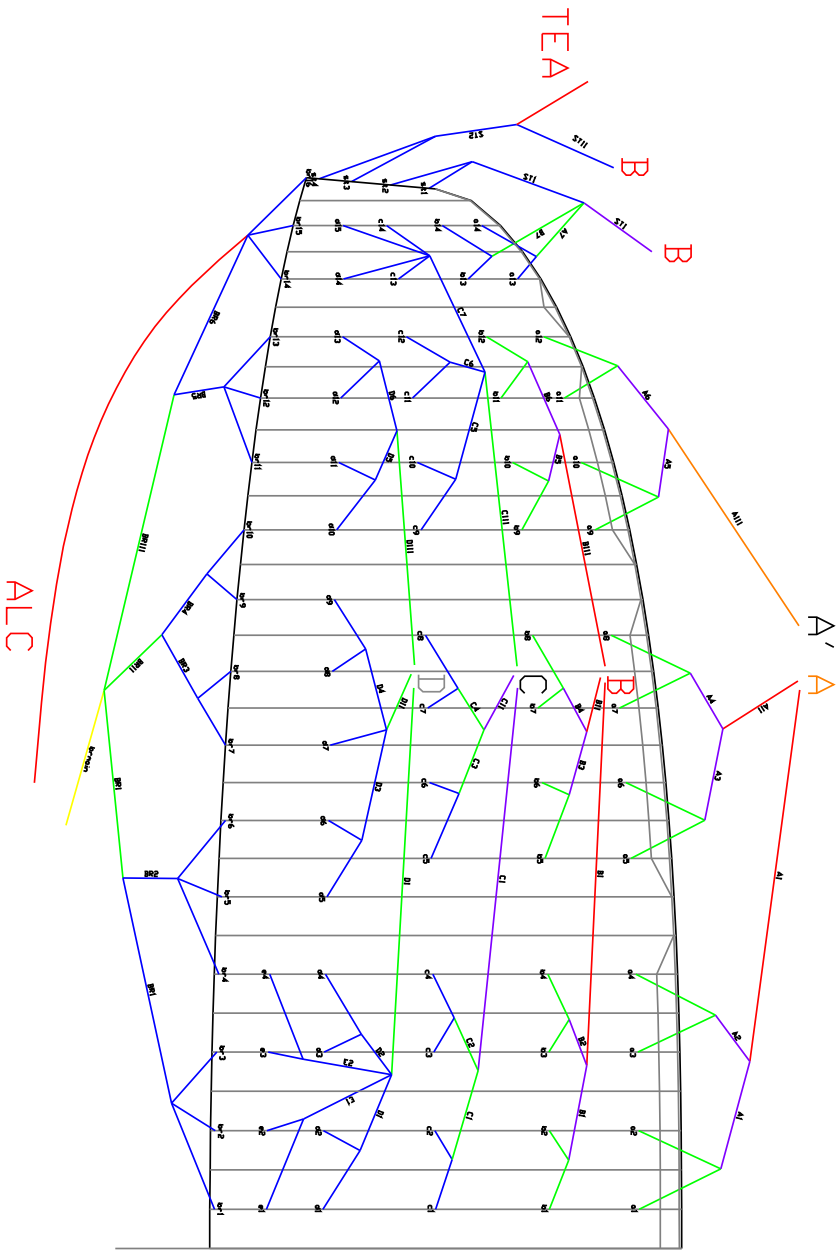

TEA
B
B
ALC
A'
A
B
C
D

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Table of individual line lenghts

	a	b	c	d	e	br
1	940	940	945	805	810	1425
2	880	875	885	750	755	1235
3	890	890	895	760	765	1145
4	925	925	930	795	800	1195
5	900	895	905	780		1100
6	860	855	865	730		1120
7	830	820	835	2615		765
8	850	840	855	705		635
9	680	665	670	720		715
10	595	575	555	685		685
11	640	615	615	580		1010
12	600	580	535	620		835
13	575	525	655	570		745
14	475	450	595	735		720
15				675		655
16						720

Table of total line lenghts

	a	b	c	d	e	br
1	6580	6545	6630	6785	6895	8025
2	6520	6485	6570	6730	6840	7835
3	6505	6470	6555	6715	6825	7745
4	6540	6505	6590	6750	6855	7645
5	6520	6485	6570	6750		7550
6	6475	6445	6530	6695		7570
7	6465	6435	6520	6655		7435
8	6485	6455	6540	6670		7305
9	6415	6375	6495	6690		7210
10	6330	6290	6385	6580		7180
11	6250	6215	6275	6475		7145
12	6210	6180	6195	6385		6965
13	6050	6030	6125	6335		6865
14	5950	5955	6070	6205		6735
15	5940	5985	5960	6145		6660
16				5985		6630

	A	B	C	D	E	BR
1	1405	1400	1415	1675	1775	1620
2	1380	1375	1390	1650	1750	1470
3	1465	1450	1470	1925		810
4	1485	1475	1495	1930		630
5	1300	1255	1790	1280		730
6	1175	1145	1625	1150		635
7	1250	1280	1435			

	A	B	C	D	E	BR
I	4220	4200	4260	4295		2425
II	4140	4130	4185	4030		3305
III	4430	4445	4030	4605		2715

st1	545	ST1	1160	brmain	2550
st2	590	ST2	5235		
st3	470	STI	4215		
st4	490	STII	245		

Technora 7343-090-005:

Technora 7343-140-006:

Technora 7343-190-024:

Technora 7343-280-011:

Technora 7343-280-018:

Technora 7343-420-041:

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Table of individual line lenghts

	a	b	c	d	e	br
1	980	980	985	840	845	1485
2	920	915	925	780	790	1290
3	930	925	935	790	800	1195
4	965	960	970	825	830	1245
5	940	935	945	815		1150
6	895	890	900	760		1170
7	865	855	870	2725		795
8	885	875	890	735		660
9	710	690	695	750		745
10	620	600	580	715		715
11	670	640	640	605		1185
12	625	605	555	645		1000
13	600	545	685	595		895
14	495	470	625	765		855
15				705		775
16						745

Table of total line lenghts

	a	b	c	d	e	br
1	6880	6845	6925	7080	7190	8345
2	6820	6780	6860	7020	7135	8150
3	6805	6765	6850	7010	7120	8055
4	6845	6805	6890	7045	7150	7955
5	6820	6780	6865	7045		7860
6	6775	6740	6825	6990		7880
7	6765	6730	6815	6945		7740
8	6790	6755	6840	6965		7600
9	6715	6670	6795	6985		7505
10	6625	6580	6680	6870		7475
11	6545	6505	6565	6760		7440
12	6500	6465	6480	6670		7250
13	6330	6310	6405	6620		7150
14	6225	6230	6345	6485		7010
15	6210	6255	6230	6425		6935
16				6250		6900

	A	B	C	D	E	BR
1	1465	1460	1470	1745	1855	1685
2	1440	1435	1450	1725	1825	1535
3	1525	1510	1535	2005		840
4	1550	1540	1560	2010		660
5	1355	1310	1870	1335		765
6	1220	1195	1695	1200		665
7	1305	1335	1495			

	A	B	C	D	E	BR
I	4425	4395	4455	4485		2525
II	4345	4330	4380	4210		3450
III	4645	4660	4220	4815		2840

st1	570	ST1	1205	brmain	2650
st2	615	ST2	5485		
st3	490	STI	4415		
st4	515	STII	245		

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Table of individual line lenghts

	a	b	c	d	e	br
1	1020	1015	1025	875	880	1545
2	955	950	960	815	820	1340
3	965	960	970	820	830	1240
4	1005	1000	1010	860	865	1295
5	975	970	980	845		1195
6	930	925	935	790		1215
7	900	885	900	2830		830
8	920	910	925	765		685
9	735	720	725	780		775
10	640	625	605	740		740
11	695	665	665	630		1235
12	650	625	580	670		1040
13	620	570	710	620		935
14	515	485	650	795		895
15				730		810
16						775

Table of total line lenghts

	a	b	c	d	e	br
1	7170	7130	7215	7375	7495	8670
2	7105	7065	7150	7315	7435	8465
3	7090	7050	7135	7305	7420	8370
4	7130	7090	7175	7340	7455	8265
5	7110	7065	7155	7340		8165
6	7065	7025	7115	7285		8185
7	7055	7015	7105	7240		8040
8	7075	7040	7130	7265		7900
9	7000	6955	7080	7280		7800
10	6905	6860	6965	7165		7765
11	6820	6780	6845	7050		7730
12	6775	6745	6755	6955		7535
13	6600	6580	6680	6900		7430
14	6495	6495	6615	6765		7290
15	6475	6525	6495	6700		7210
16				6515		7175

	A	B	C	D	E	BR
1	1520	1515	1530	1815	1925	1750
2	1500	1490	1505	1795	1900	1595
3	1585	1570	1595	2085		875
4	1610	1600	1620	2090		685
5	1405	1360	1940	1385		795
6	1270	1240	1760	1245		695
7	1355	1385	1550			

	A	B	C	D	E	BR
I	4615	4585	4645	4675		2625
II	4535	4520	4570	4395		3585
III	4850	4865	4400	5020		2950

st1	595	ST1	1255	brmain	2750
st2	640	ST2	5730		
st3	510	STI	4615		
st4	535	STII	245		

Technora 7343-090-005:

Technora 7343-140-006:

Technora 7343-190-024:

Technora 7343-280-011:

Technora 7343-280-018:

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Table of individual line lenghts

	a	b	c	d	e	br
1	1060	1055	1065	905	910	1600
2	990	985	995	845	850	1390
3	1000	995	1005	850	860	1290
4	1040	1035	1050	890	895	1340
5	1010	1005	1015	880		1235
6	965	960	970	820		1260
7	930	920	935	2935		860
8	955	945	960	790		715
9	765	745	750	810		805
10	665	650	625	770		770
11	720	690	690	650		1280
12	675	650	600	695		1080
13	645	590	735	640		970
14	535	505	670	825		925
15				755		840
16						805

Table of total line lenghts

	a	b	c	d	e	br
1	7445	7400	7490	7660	7780	8980
2	7380	7335	7425	7600	7720	8770
3	7365	7320	7415	7585	7705	8670
4	7410	7365	7455	7625	7745	8565
5	7385	7340	7435	7630		8460
6	7340	7300	7390	7570		8485
7	7330	7290	7385	7525		8330
8	7355	7315	7410	7545		8185
9	7275	7225	7360	7565		8085
10	7180	7130	7235	7445		8050
11	7090	7050	7115	7325		8010
12	7045	7010	7025	7230		7810
13	6860	6840	6945	7175		7705
14	6750	6755	6880	7030		7555
15	6730	6780	6750	6965		7475
16				6775		7435

	A	B	C	D	E	BR
1	1575	1570	1585	1880	1995	1815
2	1555	1545	1565	1860	1970	1655
3	1645	1625	1650	2160		905
4	1670	1660	1680	2165		715
5	1460	1410	2010	1435		820
6	1315	1285	1825	1295		720
7	1405	1435	1610			

	A	B	C	D	E	BR
I	4800	4770	4830	4860		2720
II	4720	4705	4755	4575		3720
III	5045	5065	4585	5225		3065

st1	615	ST1	1300	brmain	2850
st2	665	ST2	5965		
st3	530	STI	4800		
st4	555	STII	245		

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Table of individual line lenghts

	a	b	c	d	e	br
1	1095	1090	1100	935	940	1655
2	1025	1020	1030	870	880	1435
3	1035	1030	1040	880	890	1335
4	1080	1070	1085	920	925	1385
5	1045	1040	1050	910		1280
6	1000	995	1005	850		1305
7	965	950	965	3035		885
8	985	975	990	815		735
9	790	770	775	835		830
10	690	670	645	795		795
11	745	710	715	675		1325
12	695	670	620	720		1120
13	665	610	760	665		1005
14	550	520	695	850		960
15				785		870
16						830

Table of total line lenghts

	a	b	c	d	e	br
1	7710	7665	7760	7940	8060	9280
2	7645	7600	7695	7875	8000	9065
3	7630	7585	7680	7860	7985	8960
4	7675	7630	7725	7900	8025	8850
5	7655	7610	7705	7905		8745
6	7605	7565	7660	7845		8770
7	7595	7555	7650	7800		8610
8	7620	7580	7680	7820		8460
9	7540	7490	7630	7840		8360
10	7440	7390	7500	7715		8320
11	7350	7305	7375	7595		8285
12	7305	7265	7280	7490		8075
13	7115	7090	7200	7435		7965
14	7000	7005	7130	7290		7815
15	6980	7030	6995	7220		7730
16				7020		7685

	A	B	C	D	E	BR
1	1630	1620	1635	1945	2060	1875
2	1610	1600	1615	1925	2040	1710
3	1700	1680	1705	2235		935
4	1725	1715	1735	2240		740
5	1505	1455	2080	1485		850
6	1360	1330	1885	1335		745
7	1450	1485	1665			

	A	B	C	D	E	BR
I	4980	4945	5010	5040		2810
II	4900	4880	4935	4750		3845
III	5235	5255	4760	5420		3170

st1	635	ST1	1345	brmain	2950
st2	685	ST2	6195		
st3	545	STI	4985		
st4	570	STII	245		

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Table of individual line lenghts

	a	b	c	d	e	br
1	1145	1140	1150	980	985	1730
2	1075	1070	1080	915	920	1505
3	1080	1075	1085	920	930	1395
4	1130	1125	1135	965	970	1450
5	1095	1085	1100	950		1340
6	1045	1040	1055	890		1365
7	1010	995	1010	3180		930
8	1035	1020	1040	855		775
9	825	805	810	875		870
10	720	700	680	830		835
11	780	745	745	705		1390
12	730	705	650	755		1175
13	695	635	795	695		1055
14	575	545	730	890		1005
15				820		915
16						865

Table of total line lenghts

	a	b	c	d	e	br
1	8095	8050	8145	8325	8455	9730
2	8025	7980	8075	8260	8390	9505
3	8015	7965	8060	8245	8375	9395
4	8060	8015	8110	8290	8415	9280
5	8040	7990	8090	8295		9170
6	7990	7945	8040	8230		9195
7	7980	7940	8035	8185		9030
8	8005	7965	8060	8210		8875
9	7925	7870	8010	8230		8770
10	7820	7765	7880	8100		8730
11	7725	7680	7745	7970		8690
12	7675	7635	7645	7865		8470
13	7475	7450	7560	7805		8360
14	7355	7360	7490	7655		8200
15	7335	7390	7355	7585		8115
16				7380		8065

	A	B	C	D	E	BR
1	1705	1695	1715	2035	2160	1965
2	1685	1680	1695	2015	2135	1795
3	1780	1760	1785	2340		980
4	1810	1800	1820	2350		775
5	1580	1525	2180	1555		890
6	1425	1395	1975	1400		780
7	1520	1555	1745			

	A	B	C	D	E	BR
I	5235	5200	5265	5295		2940
II	5155	5135	5190	4990		4030
III	5510	5530	5005	5695		3325

st1	665	ST1	1405	brmain	3100
st2	720	ST2	6525		
st3	575	STI	5250		
st4	600	STII	245		

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9. RISERS: DESIGN AND ACCESSORIES

Figure 1 Risers in lower hangopint configuration (steering line is led through one pulley only).

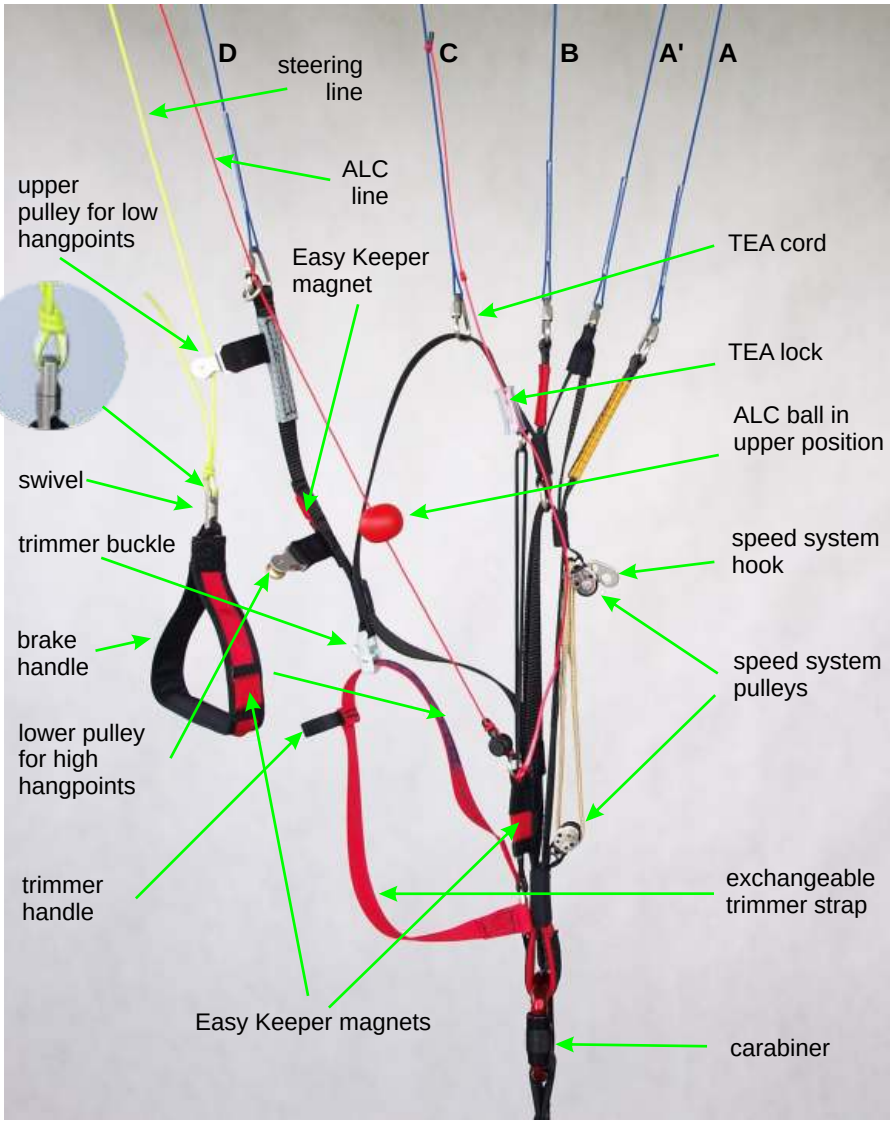


Figure 2 High hangpoints (steering line is led through both pulleys). ALC ball in low position.

Figure 3 Additional magnet for brake handle (high hangpoints).

Figure 4 TEA cord inactive (a) and engaged (b)

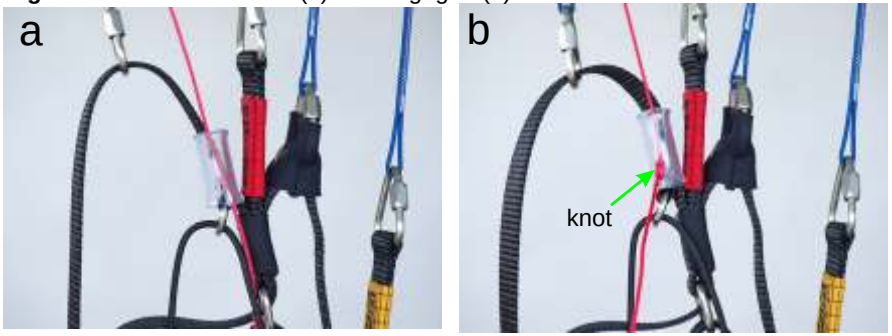
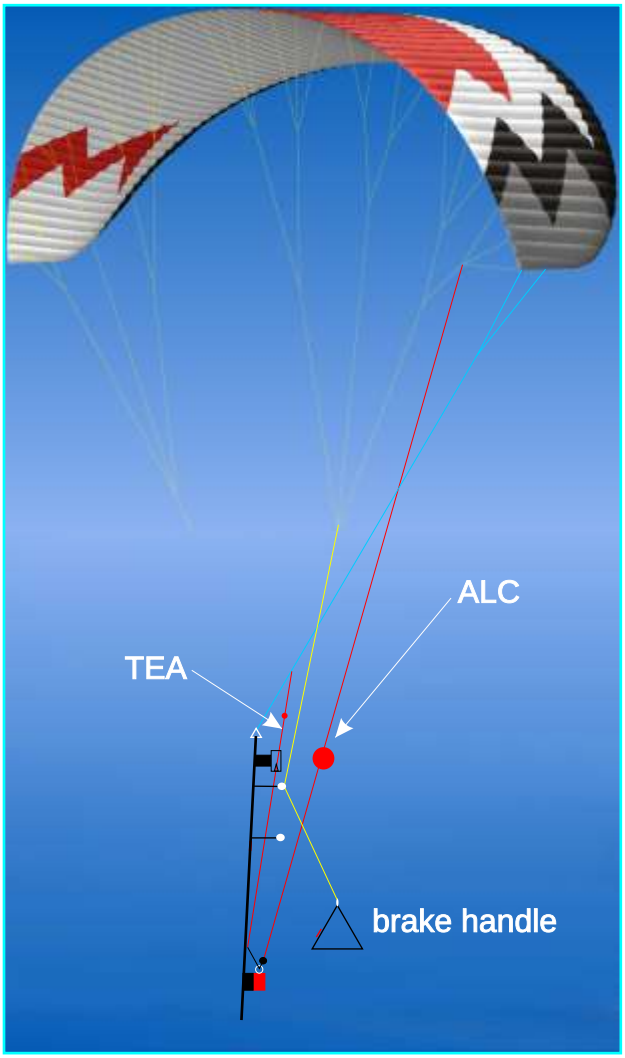


Figure 5 Beside TEA there is an additional inner loop in the risers that can be used for countering the the torque effect. There is no adjustment possibility though, while in the TEA you can have the knot in just right place.

Figure 6
Steering systems scheme



Here is a simple guide to find your way in a maze of risers and their various handles.

Classic brakes operate along entire trailing edge, ALC system is active on the outer parts of the trailing edge, and the TEA affects stabilizer only.

With this arrangement the pilot has full range of steering systems at his disposal and can freely choose between them, according to his needs and current situation.

Figure 7 Trimmers influence on the wing profile

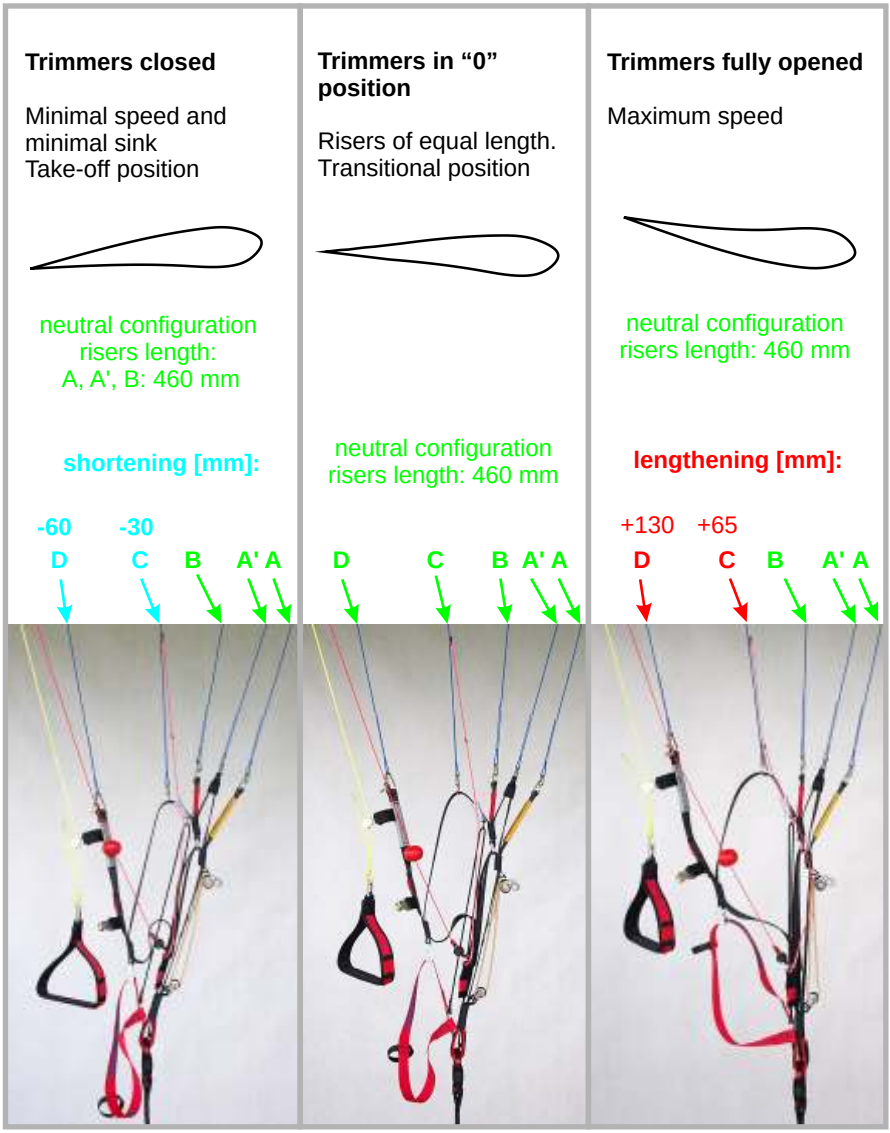


Figure 8 Trimmer settings influence on speed-system action

Lengthening and shortening values are given in respect to neutral risers length: 460 mm

Full acceleration with closed trimmers: good speed, easy steering, decreased stability. Classic speed-system action. This setting is not advised for using speed-system.

shortening [mm]

-60 -75 -90 -130 -170

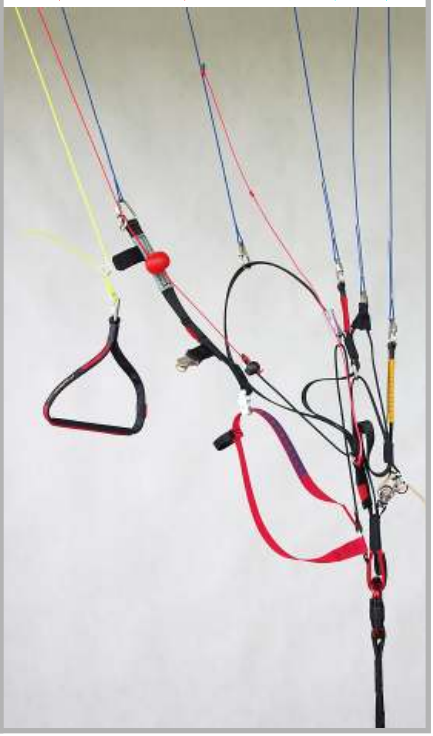
D C B A' A

Full acceleration with opened trimmers: small angle of attack, maximum speed. Great stability and hard steering. Advised use of ALC system.

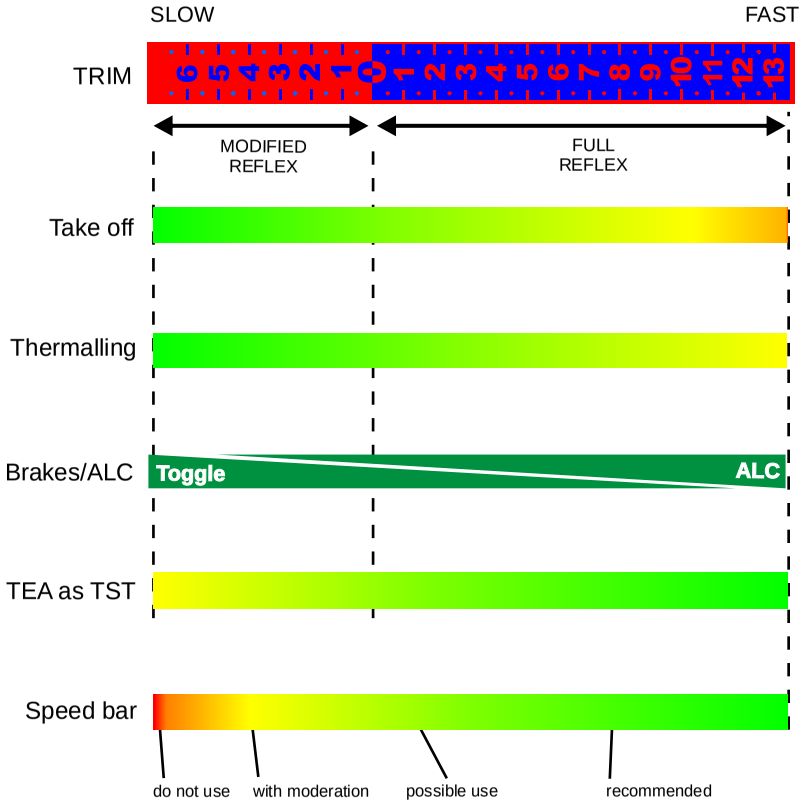
lengthening [mm] shortening [mm]

+130 +20 -90 -130 -170

D C B A' A



nucleon - trim usage information



In nil wind conditions, it is preferable to take off with the trims fully closed on Slow. The stronger the wind, the faster the trim setting towards the neutral "0" position. Faster trim settings can render the take off difficult or even impossible, depending on wind strength.

Thermalling the Nucleon is safe at any trim setting. However, the best sink rate is achieved with the trims fully closed on slow. To thermal in turbulence, appropriate release of the trims to a faster setting is recommended to increase stability.

The ALC steering balls allow for lighter handling when used together with the brakes, especially useful at faster trim settings and/or on speed bar. They can also be used on their own to change direction, when not too low near the ground.

In case of harnesses using high hangpoints the TEA system can be used for directional control as well, especially at fast trim and speed system settings. It works in the same way as TST used in our earlier paragliders. Remember though, that TEA must be assembled on both sides to use it in this character.

The speed bar should be used on faster trim settings. It should be avoided on slow trims (zero or slower) when the wing is not in a full reflex configuration, as the risk of collapse may be increased in turbulence.

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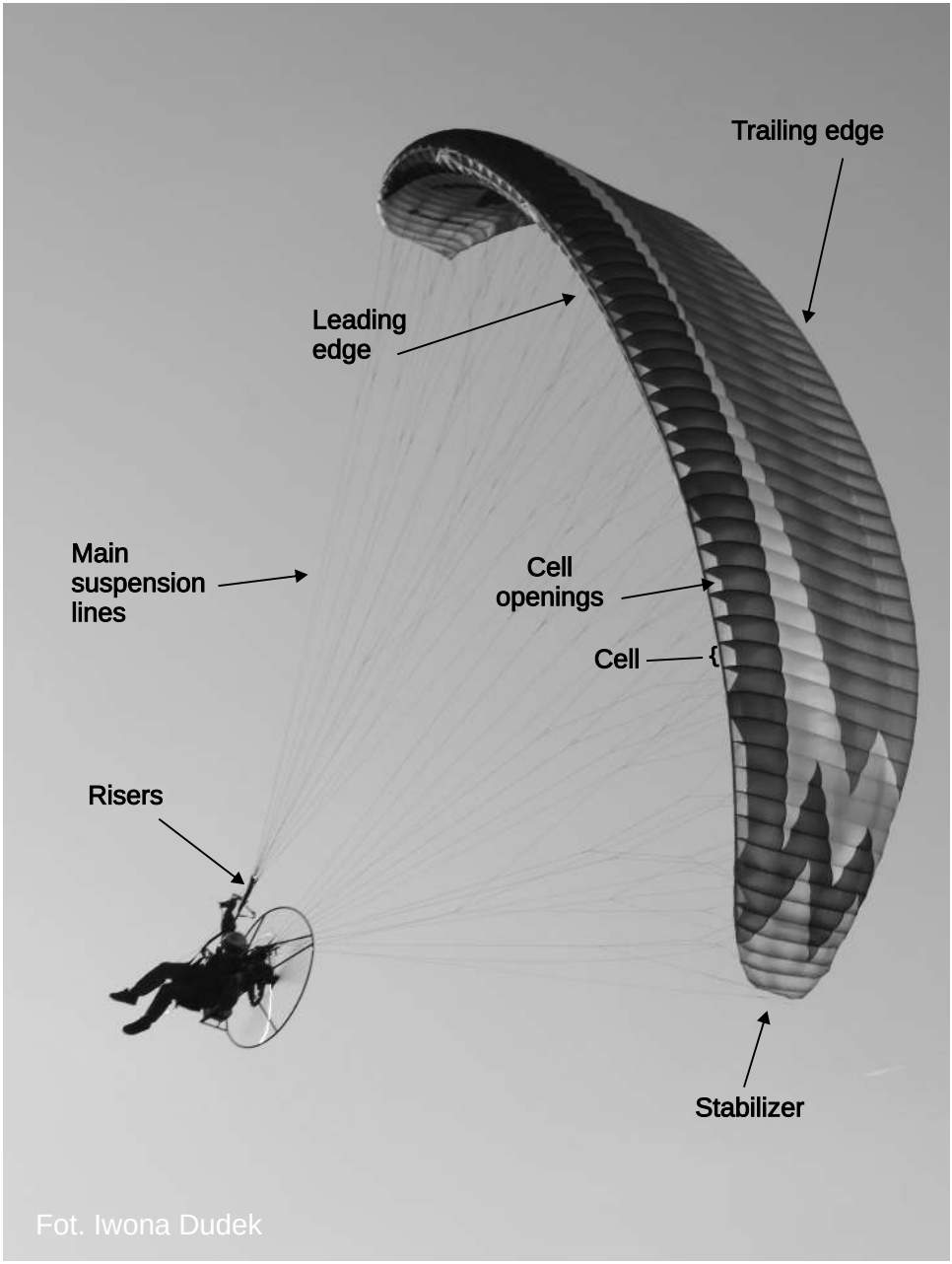

Fot. Iwona Dudek

V 20.03.2012

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