

user manual

manta



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**DUDEK**  
paragliders

[www.dudek.com.pl](http://www.dudek.com.pl)

## **NOTE!**

### **Please read this operating manual before the first flight**

#### **IMPORTANT:**

Remember to fill in and send us the registration card, which is sewn on to the trailing edge of the paraglider. When we receive it, we will send you the Warranty, AeroCasco or Golden Package confirmation (whichever you choose). You will also receive small gifts.

If you have bought the paraglider together with the Golden Package, you will receive:

- Golden Package, AeroCasco and Warranty confirmation (after you have sent the registration card),
- free first technical servicing,
- Cordura backpack
- speed system
- small gifts.

More information about the Golden Package on page 22.

If you have bought the paraglider without the Golden Package, but with AeroCasco, you will receive:

- AeroCasco and Warranty confirmation (after you have sent the registration card)
- small gifts

More information about AeroCasco on page 21.

If you have bought the paraglider without the Golden Package or AeroCasco, you will receive:

- Warranty confirmation (after you have sent the registration card)
- small gifts

More information about Warranty on page 20.

The above mentioned confirmations will allow us later to identify the paraglider, to categorize it into a proper insurance group and to determine the insurance expiry date.

Also, the confirmations are useful, when you want to sell the paraglider (they allow the new owner to keep all the benefits).

**NOTE!** If you aren't the first owner of the paraglider, you should send us the registration confirmation together with a copy of previous users' logbooks (total of flying hours) within 14 days from the date of purchase, in order to be able to keep the warranty.

Details on page 20.

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## **1. Introduction**

### **CONGRATULATIONS!**

We are pleased to welcome you among the number of discerning Dudek Paragliding pilots. You are now a proud owner of a state-of-the-art paraglider. Extensive development by using the most modern methods and thorough tests make the Dudek MANTA a user friendly paraglider without neglecting performance and fun of flying.

**We wish you many enjoyable hours flying your new Dudek MANTA.**

### **DISCLAIMER.**

**Please read this manual carefully and note the following details:**

- **The purpose of this manual is to offer guidelines to the pilot using the Dudek MANTA wing and it is by no means intended to be used as a training manual for this or any other paraglider in general.**
- **You may only fly a paraglider when qualified to do so or when undergoing training at an accredited School or Instructor.**
- **Pilots are responsible for their own safety and their paraglider's airworthiness.**
- **The use of this paraglider is solely at the user's own risk! Manufacturer and distributor do not accept any liability.**
- **This paraglider on delivery meets all requirements of the CEN/AFNOR. Any alterations to the paraglider will render its certification invalid.**

### **NOTICE**

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

## 2. On the wing

### WHO SHOULD FLY MANTA?

We have designed this paraglider with following pilots in mind:

- People, who having acquired experience on recreational wings, would like to try their hand at flying a paraglider that enables cross country flights, without giving up joy of flying.
- Intermediate competitors, who would like to start taking part in competitions with big safety margin on their side.
- Motoparagliding enthusiasts.
- Pilots living rather in flat countryside, who need a very stable wing and one efficiently gaining altitude when winched.

### **The Dudek MANTA is a perfect combination of performance and safety.**

The MANTA has a slim, elliptical planform with slightly rearward swept tips. Its triple cells ensure a smooth top surface, exact aerofoil reproduction on entire wingspan, and yet most importantly, fewer suspension points. The MANTA has greatly reduced the number of lines used and thus the associated parasitic drag, which particularly at high speed gives an exceptional glide angle.

Four extra cells on each side form stabilisers that ensure stable straight flight and effective and co-ordinated turns. The aerofoil of the MANTA was tested and analysed using numerical methods, still it owes much to experiences we gained from designing and everyday use of our previous paragliders. Its relatively thick shape offers excellent safety and lift coefficient.

The precise shape of leading edge is maintained with internal reinforcements of laminated cloth, which is used to cover areas close to cell openings and trailing edge as well. The cell openings of the MANTA are located on the undersurface of the aerofoil, close to its leading edge. Dacron flares at the suspension points and between-line reinforcements ensure an equal distribution of load throughout the canopy.

Large cross ports provide good air movement inside the wing and its quick inflation. Yet the number of ports was reduced, so that the profile of the canopy is less affected.

Our paragliders are manufactured using the best materials available. We are sure it's the safety and reliability that counts, not the price. Such an attitude allowed us to extend the guarantee period up to three years - more details on page 20.

## THE CLOTH

Each cloth has its own characteristics, so they must be properly matched in order to create a harmoniously behaving paraglider. For the upper surface of MANTA we used a Porcher 9092 cloth, named SkyTex Aquatic (44g/m ). Basically it's a nylon cloth covered with superb E85A impregnate, introduced into mass production in January 2002, after a series of extensive laboratory and real flying tests. Such covered cloth is not that stiff and - what's most important - has increased tear, stretch and UV resistance. It is not silicon, so minor repairs can be easily done with self-adhesive strips.

The lower surface is made of SkyTex 9017 with E38A impregnate (39g/m). This cloth has a great weight/resistance ratio and is one of the biggest Porcher Marine successes in providing proper materials for paragliding industry.

The ribs must be as rigid and stretch-resistant as possible. We found these qualities in SkyTex 9017 with E29A impregnate.

## RIGGING SYSTEM

We chose latest Cousin Trestec product here, that is Dyneema Ultimate Prestretched lines. It features high wear resistance and is very strong while relatively thin.

Dyneema Ultimate is additionally stabilized during production process - each thread is first stretched with carefully chosen force and then thermally stabilized in strictly observed temperature. As a result we got a line that is a lot less elastic, less likely to shrink while wet and with equal load distribution on entire length. All MANTA lines have coloured polyester sheath covering a core inside. The rigging system consists of individual lines looped and stitched at each end. There is a high diversity of lines used, as we wanted to have best strength/diameter ratio in each lines group, depending on existing loads (see table on pages 25-26).

The upper level (gallery) lines start at the attachment points. Every three lines adjoin to one suspension line. The outer lines are first gathered by twos and threes in a middle level lines, and these in turn by twos in one line. Main suspension lines attach to risers with triangular quick links (maillons). The stabilizer lines connect the outer suspension points to the maillons in cascades as well.

The same story goes as for steering lines. With consecutive cascades they lead down to main brake lines which then go through pulleys connected to the C-riser and finish at the brake handles. The outer steering lines in upper level additionally go through a metal loop to improve steering effectiveness.

Main brake lines are attached to the brake handles at their optimum trimming point, marked on the line by a black dot. This adjustment ought not be altered. Having the handles attached above optimal marks will cause

permanent brake application and possible accidents. Attachment below these points is not advised too, as it will significantly diminish tension of the trailing edge, thus changing wing behaviour in some situations.

Suspension lines are coloured depending on their strength and diameter as follows (colour code can be slightly different):

diameter: 1,9 mm; strength: 328 daN; colour: blue

diameter: 1,5 mm; strength: 216 daN; colour: red

diameter: 1,3 mm; strength: 146 daN; colour: yellow

diameter: 1,1 mm; strength: 128 daN; colour: green

Main suspension lines adjoin to stainless steel triangular quick links (maillons). Additionally there are rubber "O rings" to prevent slipping of the lines on the quick link.

There are 4-way risers in MANTA (with A riser split in two) with presumed speed-system installation. The outer A suspension line connects to short A' riser (blue), other A lines to proper A riser (gold), B and stabilizer lines go to B riser (red), C lines to C riser (black), and D risers (grey, with pulleys added) gather D and steering lines.

As mentioned, risers are coloured for differentiation purposes:

A - yellow - used for launching,

A' - blue - used for Big Ears,

B - red - used for B-stall,

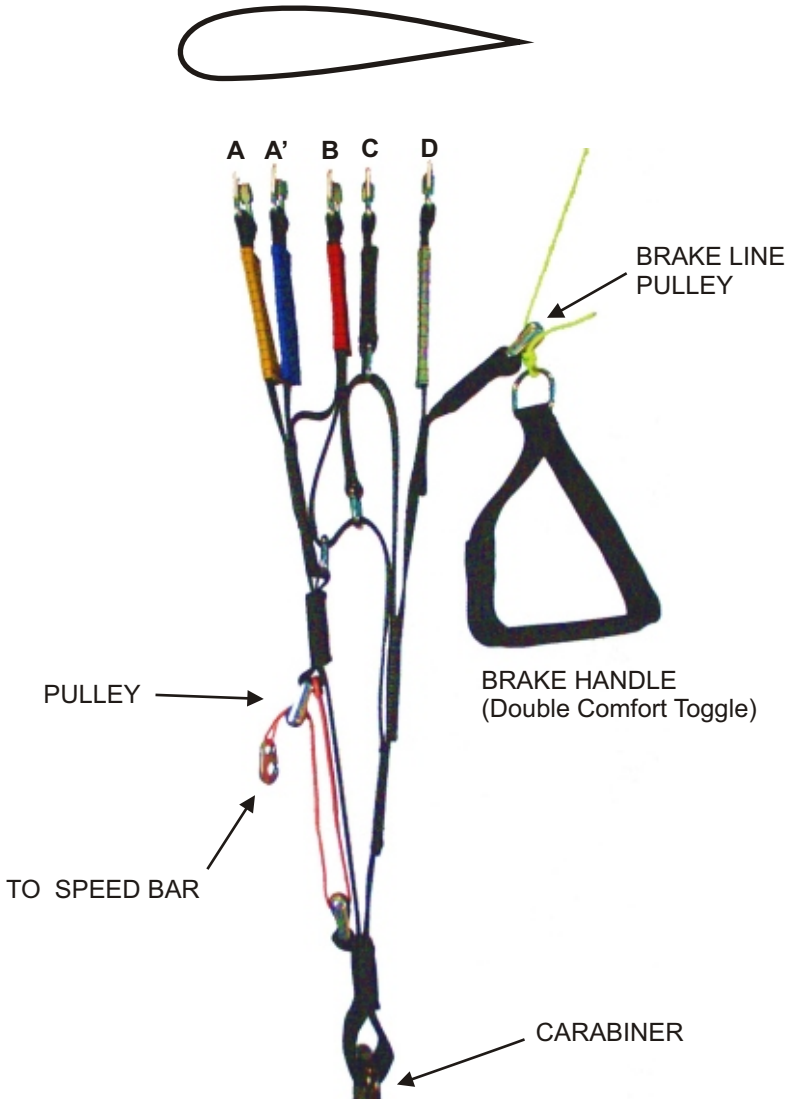
D - grey - used for deflating the canopy in strong winds (aborting launch).

### Double Comfort Toggle



**DCT:** in order to satisfy different needs of our clients we have created a Double Comfort Toggle system. With this solution it is possible to have your brake handles in stiff or soft configuration, with no need to buy another set of toggles and replace them every time. All you have to do now is take out the stiffening rod and there you are - the soft handle is ready to use.

RISERS



### 3. Speed system

The heart of speed system is a line sewn into A riser, running through two pulleys and finished with a loop with small hook. There you attach the speed bar line. In normal flight all risers have an overall length of 50 cm. Speed system affects risers A (with A'), B and C. When the bar is being pushed, A and B riser gradually shorten, until there is a 1-cm difference between them. Their minimal length is respectively 39 and 40 cm. C-risers are shortened proportionally, up to minimal length of 45 cm. D-riser retains its original dimensions.

**An incorrectly fitted speed system leads to loss of certification!**

#### **SPEED SYSTEM ADJUSTMENT**

Most of modern harnesses are equipped with special speed system pulleys and sometimes even its own integrated speedbar. If it's not the case, first you need to have some pulleys attached in such a way that will allow the pilot maximize the output of his/her legs with correct power vector, without pushing the harness back. The speed system cord must be firmly attached (with bowline or other non-slipping knot) to the speed bar. The other end of the cord must be ran upward through the harness pulleys, to be firmly attached to a hook or small carabiner with strong spring action. Overall length of speed system cord should allow pilot to put his/her feet easily into the bar when in flight, and yet should be short enough to cover the full speed range. To exercise full speed with Manta speed system, double speed bar is advised.

Make sure that both cords on the speed bar are equal, as even slight difference can result in constant turning of the paraglider. Test your speed system thoroughly on the ground before flying with it!

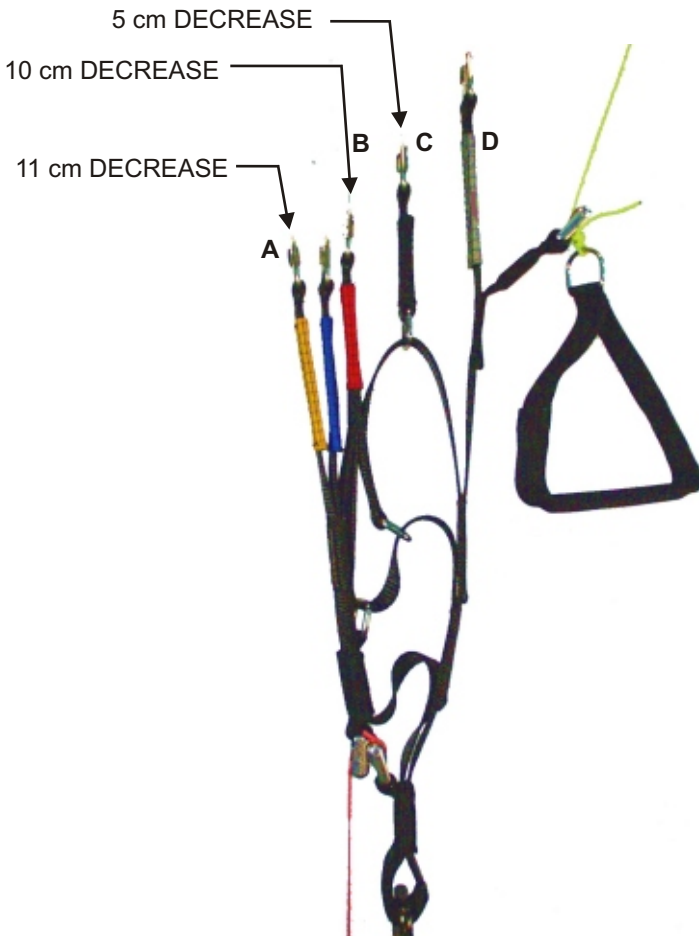
The maximum action is reached when speed system pulleys touch.

#### **SPEED SYSTEM USAGE**

Attach paraglider risers to the harness with main carabiners. Then connect speed system cords with hooks or quick-links. Before launching make sure that speed system is untangled and runs freely.

To use the speed system simply place your feet on the speed bar and push forward on a horizontal plane. If you notice a sudden loss of pressure on the bar, it can be a sign of imminent frontal collapse. In such case release the bar and thus speed system immediately. Watch out for such things - quick wits can spare you most collapses and in general increase your awareness

RISERS - FULL SPEED



of what's going on around you. Slight speed-bar operation can also optimize your flight, i. e. when entering a thermal. Speed system activation diminishes your paraglider angle of attack, so that its airspeed is increased. Yet simultaneously the canopy is less stable - that's why you should avoid using speedsystem in turbulent conditions, close to the ground or near other airspace users!

Do not use the speed system in any extreme manoeuvres! If the canopy does collapse, release the speed bar immediately and correct the situation as usual.

## 4. Harness

Dudek MANTA pilot will fly happily using any certified harness with hang point between 35 cm and 49 cm from the seat (however the safest distance is 40 cm). Distance between carabiners should be between 37 cm and 45 cm, still in this case the best option is 40 cm too.

Please note that any modification of seat/hang point distance changes the position of the brakes in relation to the pilot's body. You must remember that in each configuration the effect of your hands' movement will be different.

Caution! Too tight cross straps can affect dramatically the handling, and thus may not actually contribute to higher safety. Have them tightened just the correct amount.

## 5. Flight

### PRE-FLIGHT CHECK

A thorough pre-flight check is essential for any aircraft; the Dudek MANTA is no exception. Having unpacked and laid out the paraglider, following checks must be made:

- Canopy, lines and risers condition. Do not start if any damage is noticed.
- The paraglider should be arranged in such a way that the centre section A-lines (of golden risers) will strain earlier than the outer ones. This ensures an easy and symmetrical launch.
- All lines and risers should be separated. Make sure they are not tangled and pay special attention to the A-lines, which should run free from the A (golden band) and A' risers (blue band) to the canopy.

- It is equally important to untangle the brake lines so that they will not catch anything on the ground during launch. They must be firmly attached to the brake handles and run freely through the pulleys to the trailing edge.
- See that the risers are not twisted. It is very important not to loop any lines around the canopy. The so-called "line-over" may have disastrous consequences during take off.

Before every launch thoroughly check lines, risers and canopy! Do not launch in case of even the smallest damage!

**Always put on and fasten your helmet before clipping in to the harness. Check quick links (maillons). They can unscrew, especially when the wing is new. Check main carabiners. They must be properly mounted, closed and locked.**

## LAUNCH

With little or no front wind you should use a **classic start**.

Facing the wind you should pick up riser on one side and keeping it flat place it over your shoulders (A riser must lay on top). Clip it into carabiner while taking care not to turn the risers in any way, and repeat the actions on the other side. Lock the carabiners. Grip the brake handles and A-risers (marked with golden band), holding them at the stitching, just under the quick-links.

Spread your slightly bent hands out, slightly down and back. All risers but the A should be placed near your elbow joints.

Apply some tension to check if the A risers stay on top and the lines are not tangled. Take a step back, bow down a little and run forward. After the initial inflation smoothly move the hands up and over your head until the wing will be directly above you. Check the wing and let the A risers loose. Pump out possible faults and keep an eye on position of the paraglider. Side drift is corrected best by moving yourself under the canopy, as long as the launch space permits. In order to keep the wing in the air the suspension lines must stay taut all the time, so in light winds you will have to run forward. With stronger winds you can control the wing while standing still. When leaving the ground apply some brakes, then release it after gaining some distance from the ground.

**Reverse launch** can be used when the wind speed rise over 3 m/s. After clipping the risers into carabiners turn back to face the wing, moving one of the riser groups over your head. As a consequence, you will have the risers crossed. Unlock brake handles and grip it outside of the risers without

crossing neither arms, nor lines. Now take corresponding A risers on both sides. Make sure that the wing inflates symmetrical and the lines are not tangled. Building up tension with a few steps back and simultaneously lifting the A risers (without closing them to you) will make the paraglider rise. When it arrives over your head, stabilize it with the brakes, check again if everything is OK and turn.

Remember to turn always in the same direction. The turn itself should be quick and smooth. While turning you have to release the brake handles and grip them again facing forward. Last check of the wing & free space to launch and off you go.

**CAUTION:** When deflating the canopy in strong winds (e. g. aborting a launch), use the D risers, not the brakes. Using the brakes in strong wind causes more lift, that eventually can lift the pilot up and drag him/her back.

### **URNS:**

The Dudek MANTA is a very responsive wing; it has a very easy handling and reacts instantly to any steering input, with progressive forces on the brakes. Adding some weight shift will make the paraglider turn really quick and tight.

The combined technique (weight shifting and brake input) is the most efficient method. The turn radius is determined by the amount of inside brake used and weight shift. Additional application of a little outside brake after initiating the turn with maximum weight shift increases efficiency and the outboard wing's resistance to collapse (in turbulence, the edge of a thermal etc).

In case it is necessary to turn the Dudek MANTA in a confined area at slow speed (e.g. slope soaring), it is recommended to steer the decelerated canopy by loosening the brake at the outside of the turn while applying a little more brake on the inside of the turn.

When entering a turbulent area you should brake a little, just to put up the tension. It will allow you to react instantly in case of a problem.

**CAUTION:** Too hard or too quick pulling of one brake can cause the wing to enter a spin.

### **THERMALLING AND SOARING**

When flying Dudek MANTA minimum sink is attained with slight brake pressure applied (10 cm to 15 cm depending on pilot's weight). In turbulent conditions the canopy should be flown with a small amount of brake applied. This improves overall stability by increasing the angle of attack of the canopy. The canopy should neither rock back nor surge forwards, but always remain above the pilot. In order to achieve it, a pilot should accelerate the wing by letting off the brakes when entering a thermal (accordingly to its strength) and

should brake the canopy on exiting. This is part of basic active flying that can spare you many potential collapses.

When soaring the slope, a minimum height of 50 m above ground is recommended for safety reasons. It is important to comply with the rules of air traffic, especially when many pilots share airspace close to a hill. In such conditions the avoidance manoeuvres often are not possible.

### **FLYING WITH SPEED SYSTEM ENGAGED**

When flying into head wind or through sink it is advisable (for the sake of best glide angle) to increase speed, as long as conditions are not too turbulent. Still with application of speed system the angle of attack diminishes and the canopy may tuck easier than in normal flight. The faster is your flight, the more dynamic are tucks and stalls. See "Speed system" section.

### **LANDING**

The Dudek MANTA is easy to land. Final leg of the landing approach must bring you into wind. At approximately 1 meter above the ground pilot should flare the canopy, applying the brakes accordingly to conditions. The glider may even climb again for a while gaining some height, if too much brake is used.

Strong wind landings hardly requires braking, if any at all! Use D-risers (coloured grey) to deflate the canopy after landing. Using the brakes will probably result in pilot being lifted and dragged backwards.

The final glide of the landing approach should be straight and smooth. Steep or alternating turns can result in a dangerous pendulum effect near the ground.

### **WINCHING AND MOTOPARAGLIDING**

During tests, numerous flights were made with winch start and backpack power units, as these are the only means to gain some height in flatlands. Absolutely no contradictions were found for using MANTA in such flights.

**CAUTION:** During start, especially after a winch or with a motor, always remember to bring the wing directly over your head. MANTA's aerofoil and its angle of attack were arranged to give maximum lift coefficient with relatively high safety. As a result of its thick aerofoil it can stay behind a pilot, if he neglects bringing it over head.

### **AEROBATICS**

MANTA was not designed for doing aerobatics.

## 6. Rapid Descents

### BIG EARS

You can deflate the wing tips by pulling down the A' risers (blue band) approximately 50 cm simultaneously.

It is important not to let go off the brake toggles while entering the Big Ears manoeuvre. The paraglider will maintain straight course with an increased sink rate (up to some 5 m/sec). The canopy remains completely controllable with weight shifting. On releasing the A' risers the canopy usually reinflates spontaneously, or can be aided by a long pump until the tips get clear.

CAUTION: Check out the Parachutal Stall section.

### SPIRAL DIVE

It is characterized by reaching the highest sink rates. Significant G-forces, however, make it difficult to sustain a spiral dive for long, as it can place high loads on the pilot and glider.

Never do this manoeuvre in turbulence or at too high bank angles. You have to watch constantly the situation, in order to prevent your spiral from turning into a spiral dive (sink rate over 16 m/s).

Usually at excessive and uncontrollable spiral dives the outer wing tip of MANTA goes into flutter or collapses, thus gradually slowing the dive. Still, if pilot releases the inner brake and the wing does not start slowing down on its own, you have to aid this process with the outer brake.

Characteristic feature of MANTA is that the outer wing tip goes into flutter at excessive und uncontrollable spiral dive, gradually slowing the dive.

### NEVER DO BIG EARS IN A SPIRAL!

**Tests have proven that loads in a dive can be even higher than those used in certification tests (i.e. 8 G), which could result in structural failure of the glider, as smaller number of lines is taking these high loads.**

### B-STALL

To enter a B-stall simultaneously pull both B-risers (red) by 10 - 20 cm. The wing collapses on entire span along B-row, the airflow over the top surface breaks and the canopy surface is decreased. Forward movement stops and you are descending almost vertically. Further pulling of the B-risers is not advised, as it increases the wing instability.

To exit B-stall the risers should be released in a smooth and decisive manner. On quick and symmetrical releasing B-lines the airflow reinstates and the wing surges forward to return to normal flight. If the canopy forms a horseshoe with wingtips in front of the pilot, gently apply brakes to recover.

CAUTION: see Parachutal Stall.

**All rapid descent techniques should be practised in smooth air and with sufficient height only! Full stalls and spins are to be avoided as recovery procedures, since irrespectively of paraglider type they may have dangerous consequences!**

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

## 7. Extreme Flying Manoeuvres

**CAUTION: EXTREME FLYING MANOEUVRES SHOULD ONLY BE CARRIED OUT DURING SAFETY TRAINING COURSE (INSTABILITY TRAINING) UNDER PROPER GUIDANCE! WHILE PROVOKING OR EXITING REAL SITUATIONS THERE IS A DANGER THAT YOUR ACTIONS WILL PROVE TOO QUICK OR TOO STRONG, SO YOU SHOULD EMPLOY GOOD JUDGMENT, STAY CALM AND TAKE MEASURED ACTIONS.**

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

### **ONE SIDED COLLAPSE**

May happen in strong turbulence. Usually MANTA does not turn, pilot has a couple of seconds to react with collapses of some 50%, before paraglider enters a turn. A little countermeasure will be enough to keep it on course. Under normal conditions MANTA will reinflate instantly and spontaneously.

### **SPIN AND FULL STALL**

Practically do not occur. It may happen only as a result of serious mistake or intentional action. In normal flight braking up to the stall point requires much force and its proximity cannot be overlooked.

Wing recovers spontaneously in initial phase of stall, otherwise use standard procedures.

## **WING OVER**

You make a wingover by executing a series of consecutive, alternating turns with growing bank angle. Too much banking with some flaws in coordination can evoke pretty dynamic collapse.

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

## **FRONTAL COLLAPSE**

Can happen in strong turbulence. Active piloting will usually prevent its occurrence. Under normal conditions MANTA reinflates instantly and spontaneously. Applying some brakes in the right moment will greatly speed up the recovery.

## **LINE OVER and CRAVATTE**

Not very likely when flying MANTA. Use standard action, in case of any doubts pilot should consider throwing a rescue chute.

## **PARACHUTAL STALL**

Under normal conditions does not occur. If you want to prevent it, stick to a couple of rules:

- after B-stall, release the risers quick and evenly. MANTA does not jump forward excessively.
- after Big Ears execution engage speed system. It will increase the sink rate and safety margin, as big ears constitute an aerodynamic brake with significant loss of speed.

Nevertheless, if such a situation happens, apply some pressure to speed bar and/or push the A risers forward.

## **EMERGENCY STEERING**

In case of some malfunction, which renders it impossible to control the Dudek MANTA with the brakes, you can safely steer and land using the D-risers (recommended) or stabilo lines.

## 8. Canopy care

Looking after your paraglider will prolong the life of your MANTA.

### STORAGE.

Store the paraglider in a dry space away from chemicals and UV exposure.

Never pack up or store the glider when wet. This shortens the life of the cloth. Remember that wing gets wet even while laying on a green grass in full sun, as the grass evaporate. A good precaution to avoid catching wet and/or UV is to use quickpack after rigging up, when you have to wait in start line. Always dry glider thoroughly before any packing or storage. While drying, never expose your paraglider to direct sunlight.

To avoid excessive paraglider cloth wear, do not pack it too tight.

Please note that with frequent playing with your wing on a field or a small hill your paraglider will deteriorate quickly due to its repeated rising, falling down and dragging around.

### CLEANING

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

### REPAIR

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

### DETERIORATION: A FEW TIPS!

The Dudek MANTA is mainly made of NYLON, a cloth which, like any synthetic material, deteriorates through excessive exposure to UV. 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 the bag, it should not remain in the sun for long.

The Dudek MANTA lines consist of Dyneema Ultimate inner core and polyester sheath. Putting them to excessive loads in flight should be avoided, as it can cause irreversible damage. Keep the paraglider clean since getting the dust in lines and cloth will reduce their durability. Be careful to keep snow, sand or stones away from entering the cell openings: their weight can slow down or even stall the glider, and sharp edges can damage the cloth!

Prevent lines from catching anything as they can get overstretched or torn.

Do not step onto the lines.

Uncontrolled strong wind takeoffs or landings can result in the leading edge of the canopy hitting the ground at high speeds, which may heavily damage the ribs and surface material.

Knots can chafe the 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 cloth as well, since the wave forces can cause the fabric to distort in specific areas. When taking the wing out of water, always do this by the trailing edge, so that water can flow out freely.

After 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 them with new ones immediately after contact with salty water.

**Every second year MANTA should undergo inspection by the manufacturer or authorised distributor.**

## 9. Technical Data

	Manta-25	Manta-27	Manta-29
Certification CEN / AFNOR	Standard	Standard	Standard
Number of cells	57	57	57
Surface area (flat) [m <sup>2</sup> ]	25,41	27,23	29,17
Surface area (projected) [m <sup>2</sup> ]	22,36	23,96	25,67
Span (flat) [m]	11,70	12,11	12,53
Span (projected) [m]	9,62	9,96	10,31
Aspect Ratio (flat)	5,39		
Aspect Ratio (projected)	4,14		
Sink rate [m/s]	min = 1,0 ; trim = 1,1 ; max = 2,0		
Speed [km/h]	min = 23 ; trim = 37 ; max = 48		
Max. cord [cm]	265,94	275,30	284,94
Min. cord [cm]	41,06	42,50	43,99
Distance pilot to wing [cm]	757,34	784,00	811,44
Total line length [m]	340,03	352,00	364,32
Weight range [kg]	65 - 90	85 - 110	105 - 130
Weight [kg]	6,2	6,5	6,8
Lines	Dyneema Ultimate: 1,1 & 1,3 & 1,5 & 1,9		
Fabric	top: SkyTex Aquatic 44 g/m <sup>2</sup> (E85A)		
	bottom: SkyTex New 39 g/m <sup>2</sup> soft (E38A)		
	ribs: SkyTex New 39 g/m <sup>2</sup> hard (E29A)		
	reinforcements: Mylar Polyester Scrim 180 g/m <sup>2</sup>		
Risers	PASAMON - Bydgoszcz, Poland		

## 10. Three-star security assistance ★★ ★

We are aware of the fact, that a new paraglider purchase is a big expense for every pilot. That is why we are offering a security system that will allow you to insure your paraglider against any damage. We have introduced a Three-star Security Assistance, which includes:

	★ Warranty	✓	Warranty - for each glider
	★★ AeroCasco	✓	AeroCasco - optional
	★★★ G. Package	✓	Golden Package - optional

### ★ WARRANTY

DUDEK Paragliding guarantees the airworthiness of all paragliders for either a period of 3 years or for 300 flying hours, whichever comes first. This warranty also applies to the MANTA paraglider.

#### EXCEPTIONS:

Paragliders used for educational or professional purposes are subject to a 1.5 years/150 flight hours guarantee.

If the paraglider is used for powered flights, every hour spent in the air should be counted as two.

The warranty DOES NOT APPLY to any of the following:

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

The warranty IS ONLY VALID if:

- flight is correctly registered in the logbook (incl. powered flight)
- the paraglider is handled in accordance with the operating manual
- the purchaser hasn't carried out any repair by him/herself (excl. minor repairs with self-adhesive patches - see page 23)
- the purchaser hasn't carried out any modifications
- the paraglider can be unmistakably identified
- the purchaser can proof total flying hours of the paraglider
- the paraglider is inspected every second year
- the purchaser can present the registration confirmation and the paraglider card

We shall send you the registration confirmation as soon as we receive the registration card, which you will find sewn on to the trailing edge of your paraglider. You should remove it, fill it in legibly, sign and send by registered letter.

When you sell the paraglider, please hand over this confirmation to the new owner, together with a copy of your logbook (and previous owners' logbooks). Only by sending these documents to the manufacturer, can the new owner keep the warranty.

If you aren't the first owner of the paraglider, you should send us the registration confirmation together with a copy of previous users' logbooks (total of flying hours) within 14 days from the date of purchase, in order to be able to keep the warranty. After receiving the above mentioned documents, we shall send you a new confirmation that will entitle you to all guarantee repairs within the remaining warranty period. If the previous user didn't keep any logbook, the warranty becomes null and void, as we are not able to check the paraglider's flying hours.

### **★ ★ AEROCASCO**

Normal warranty does not cover any repair of damage caused by the user or a third party. As costs of such repair can be considerable, Dudek Paragliding offers an AeroCasco insurance. It covers a one-off repair of all mechanical damage, no matter how big, caused by the user or a third party.

The only expenses the purchaser has to pay are shipping costs and the share-of-cost amount.

AeroCasco can be purchased with a brand new paraglider (within two weeks from the date of purchase) or within a year from the date of purchase, provided that the paraglider has been inspected by the manufacturer.

NOTE: In case of paragliders used by paragliding schools, the procedure of AeroCasco granting is different. Also, the extent of insurance and general conditions may be different.

AeroCasco applies only to damage caused during take-off, flight or landing.

Obviously, all the faults in the material and manufacturing flaws are covered by normal warranty.

In order to be able to get the AeroCasco repair, the following REQUIREMENTS must be fulfilled:

When buying a new paraglider:

- the purchaser must buy the AeroCasco insurance (together with the Golden Package, which is the best option, or separately)
- the purchaser should send a correctly filled in registration card (sewn on to the trailing edge) within 14 days from the date of purchase. After receiving the registration card we shall send you AeroCasco confirmation, which must be presented when the paraglider is handled for the repair. The confirmation is also necessary for a new owner to keep the insurance.

When handing the paraglider for the repair:

- the purchaser should present this registration confirmation,
- the paraglider's serial number should be identical with the one on the registration confirmation,
- the purchaser should pay a fee (as a share of cost).

AeroCasco is valid for one repair only.

There is a possibility to extend AeroCasco for one more year, if there was no damage during the first year. AeroCasco can be extended, provided that the paraglider was serviced by the manufacturer not later than a year after the date of purchase and the owner has paid the extension fee (according to the price list on the day of servicing). Remember to include the AeroCasco confirmation when you send the paraglider for servicing.

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.

### ★★★ GOLDEN PACKAGE

Golden Package is a package offer of the most popular services.

Golden Package includes:

- warranty,
- 1-year AeroCasco (with possibility of a 1-year extension)
- one free technical servicing prior to expiry of first airworthiness check
- Cordura backpack
- speed system

Golden Package does not include paragliders used for educational or professional purposes.

## SUMMARY

If you respect rules of safe flying and proper glider care, you will enjoy many years of pleasant airtime. Still, you must be aware of present dangers and stand up to them wisely. You must accept the fact that all air sports are potentially dangerous and your actual safety depends solely on you. **FLYING THE PARAGLIDER IS ALWAYS YOUR OWN RESPONSIBILITY.**

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

**SEE YOU IN THE AIR!**

## 11. What have you bought

Dudek paraglider that you bought should have the following items:

- Transport bag (with your wing inside it).
- Paraglider itself with lines and risers that have speed system integrated. Note that the speed bar is not included.
- Compression strap for tightening up a wing before putting it into a bag.
- Windsock.
- A pocket with paper work and repair wallet including:
  - A piece (10 cm x 37,5 cm) of self-adhesive fabric for small repairs. Note that even small rips placed in the vicinity of a stitch have to be repaired by an authorised service.
  - A looped and stitched 1.9 mm suspension line. It is equal to the longest line used in the paraglider and has to be used as temporary replacement only. Do not cut it if you have to replace a shorter one, just tie it at the length needed.
  - A paraglider passport with entered date of purchase and valid technical inspection (please check serial number with the sticker on a wing tip).
  - The User Manual you are reading

If you purchased the **Golden Package**, you receive in addition:

- one free of charge inspection (first one)
- one year of AeroCasco
- paragliding backpack made of Cordura
- speed-system bar

You will receive some small gifts as well.

**Remember to fill out and send us the registration card sewn in the trailing edge.**

## 12. Rigging tables

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

Line sizes in [cm]. D letter means Dyneema lines.

- xP - main suspension line of x row,
- xD - secondary line of x row,
- xT - tertiary line of x row (near the canopy),
- EC - fourth layer of steering lines (near the canopy).

### CAUTION!!!

Distances given below are to be understood as distances between connection points. When cutting a line for repairs, 20 cm more must be counted, as on each end a 10 cm stitch is required to fix the loop. The only exception is main steering line (EP1), which is looped only at the upper end, while down there is 20 cm left for fastening the brake handle (that means 30 cm more is needed).

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Lines	A Row				B Row				C Row			D Row		Steering lines				Stabilizer	
	AT	AD	AP	AP	BT	BD	BP	BP	CT	CD	CP	DT	DP	EC	ET	ED	EP	SD	SP
1	275	145		430	274,5	145		427	275,5	97	432	278,5	445	196	97	299	305	101	539
2	264,5	121		446	264,5	121		442	265,5	106	446	266	458	168	92	193		100	
3	267,5		497		267,5		493		268		498	268,5		165		255		101,5	
4	249				249,5				250			251		163					
5	240,5				241,5				242			241,5		136					
6	243				244,5				244,5			243,5		131					
7	40				38				36,5			33,5		132					
8	35				34,5				31,5			38		130					
9	49,5				50				63			67,5		136					
10	46				46,5				59,5			63,5		121					
11	46,5				48				57,5			61		112					
12														106					
13														100					
Type	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
Diam.	1,1	1,1	1,5	1,8	1,1	1,1	1,5	1,8	1,1	1,1	1,3	1,1	1,1	1,1	1,1	1,1	1,9	1,1	1,1

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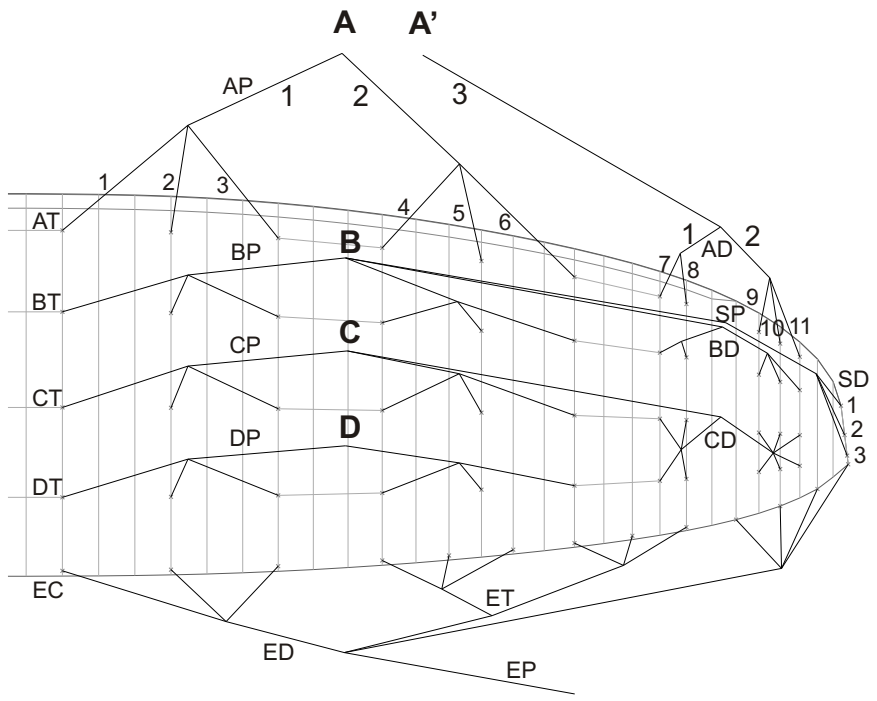
Lines	A Row				B Row				C Row			D Row		Steering lines				Stabilizer	
	AT	AD	AP	AP	BT	BD	BP	BP	CT	CD	CP	DT	DP	EC	ET	ED	EP	SD	SP
1	285	150		449	284	150		445	285	100	449	285	461	209	100	310	315	104	560
2	274	125		464	274	125		460	274	110	464	274	474	177	95	200		103	
3	277		516		277		515		277		521	277		166		305		104	
4	258				258				258			259		165					
5	249				249				249			249		141					
6	251				252				252			251		135					
7	41				40				39			36		135					
8	36				35				34			30		132					
9	51				51				64			68		138					
10	47				47				60			64		121					
11	47				47				58			62		111					
12														107					
13														98					
Type	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
Diam.	1,1	1,1	1,5	1,8	1,1	1,1	1,5	1,8	1,1	1,1	1,3	1,1	1,1	1,1	1,1	1,1	1,9	1,1	1,1

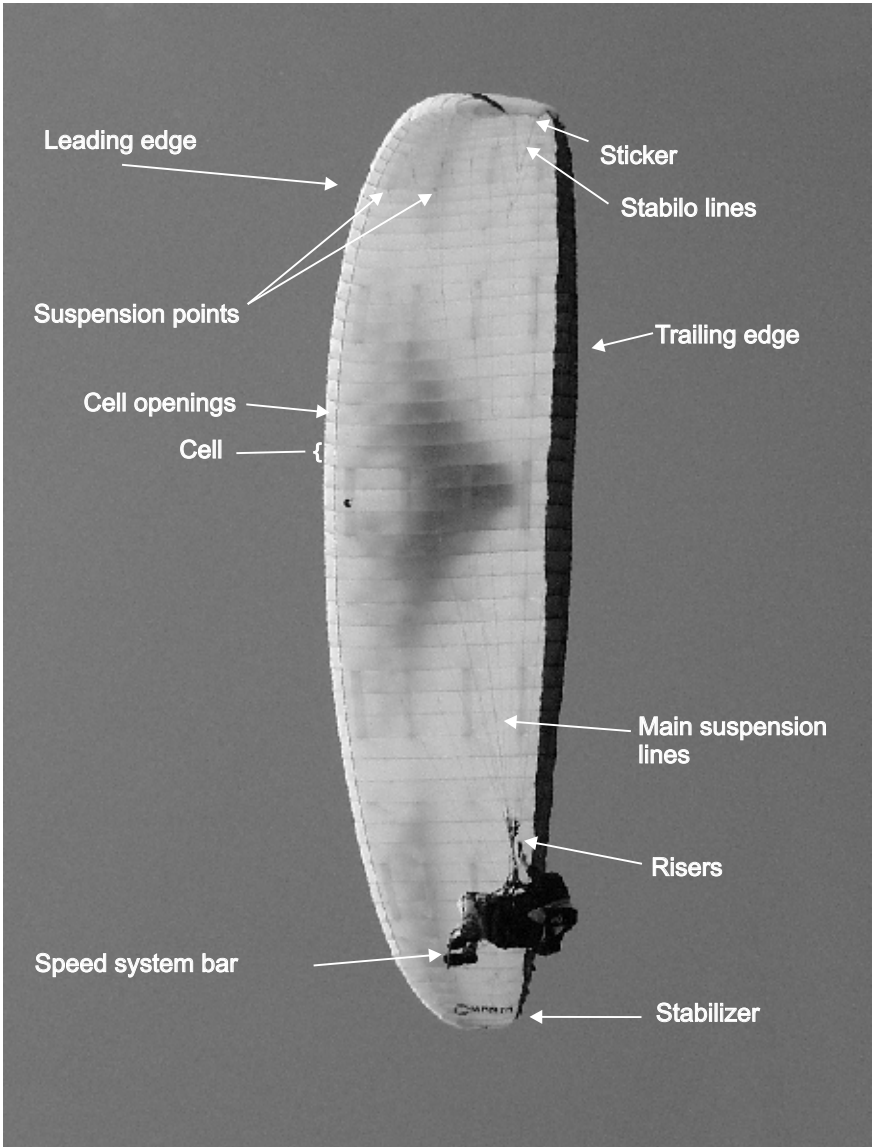
## Manta - 29

ver. 2014-12-1

Lines	A Row				B Row				C Row			D Row		Steering lines				Stabilizer	
	AT	AD	AP	AP	BT	BD	BP	BP	CT	CD	CP	DT	DP	EC	ET	ED	EP	SD	SP
1	295	145		465	294	155		461	295,5	104	487	295	482	214	104	321	330	108,5	581
2	284	121		482	283,5	129		478	284,5	114	483	284	495	182	98	207		107,5	
3			536		285,5		535		287,5		542	287		172		316		109	
4					267				267,5				269				167		
5					267,5				269				269,5				149		
6					260				262				261,5				143		
7					42,5				41,5				92,5				98,5		145
8					37				36,5				97				94		143
9					53,5				53,5				66,5				72		149
10					49				49,5				63				67,5		132
11					49,5				49,5				6				64,5		122
12																	116		
13																	109		
Type	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
Diam.	1,1	1,1	1,5	1,9	1,1	1,1	1,5	1,9	1,1	1,1	1,3	1,1	1,1	1,1	1,1	1,1	1,9	1,1	1,1

# LINING SCHEME









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