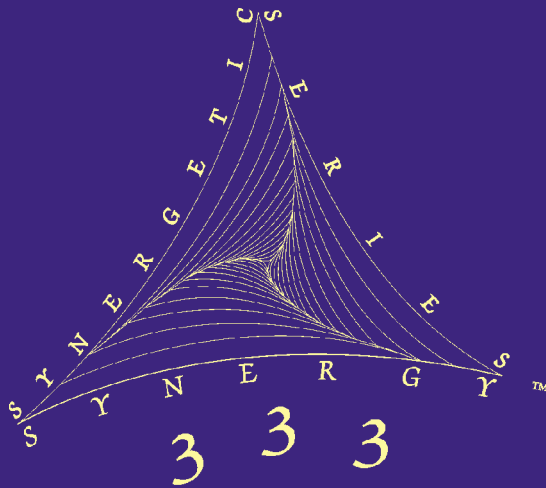


SYNERGY 333



Designed by Marc Ricketts  
Produced by InVento  
patented

Synergetic  
Series Kites

## Why Synergetic Series Kites?

Dynamic and sculptural in design, Synergetic Series Kites are optimally three-dimensional, featuring a state-of-the-art Tensegrity framework combined with a tension-suspended, aerodynamically-shaped sail. The Tensegrity framework of the kite forms one of the primary differences between the Synergetic Series Kites and other kites.

Tensegrity, short for tensional integrity, is a system where the spars do not touch each other, but are suspended in a continuous network of integrated tension lines. Tensegrity is one of the lightest yet strongest structural systems known (which is why it makes a great kite structure!) So, while your Synergetic Series Kites look elegant, even delicate... for their size and weight, they are by far the strongest kites on the market.

Another feature of the Synergetic Series Kites is their exceptional durability. The Synergetic Series Kites are specifically engineered to withstand high-impact crashes and heavy wind loads. If a Synergetic Series Kite crashes, the tension lines disperse the stress equally throughout the kite, while allowing freedom of motion between the spars in order to relieve the stress. Synergetic Series Kites give you the stability and flexibility you need for performance, plus the resiliency you want for durability.

Enjoy flying your Synergy 333!

### SYNERGY 333™

Wind Range: 6-30 mph (10-48 kph)

Best to learn in winds 10-20 mph (16-32 kph)

For learning in higher wind (over 18 mph), you can flip the kite over and fly it backwards, i.e. with the convex side facing you.

Fly Line (included): 32 feet (10m) 80 lb (36 kg) Spectra™ x 3

Synergy 333™ trademark owned by Marc Ricketts  
Spectra™ is a registered trademark of Allied Signal  
Ventex™ is a registered trademark of InVento

The Synergetic Series of Kites are designed by Marc Ricketts.



produced by:

InVento Klein Feldhus 1 D-26180  
Rastede-Neusudende Germany  
Tel: 49 44 02 92 62 0

Your Synergy 333™ is warranted against defects in workmanship and materials.

When you fly this stunt kite you are taking responsibility for its control. The manufacturer, designer, and distributors cannot accept responsibility for damage due to improper or careless use of this product.

# Synergy 333

Thank you for purchasing your Synergy 333, the first high performance tri-symmetrically designed 3 line kite on the market. You will soon find that this kite introduces you to a totally new method of flying that's easy to learn.

## Assembly:



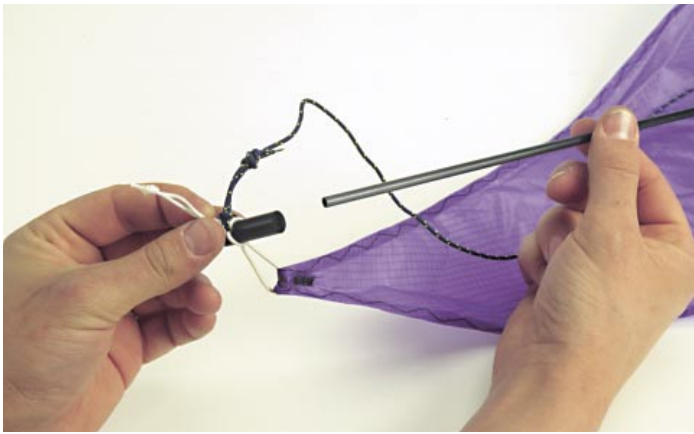
Your Synergy 333 comes complete with three Avia Sport carbon spars, Synergy 333 sail, 333 Tri grip Handle, and line set on an HQ card winder.



Unroll the sail and lay it out with the tension system (lines and caps) facing up and the logo facing down.



Take one of the three spars (they are all the same) and slide it under the lines attached to the kite.



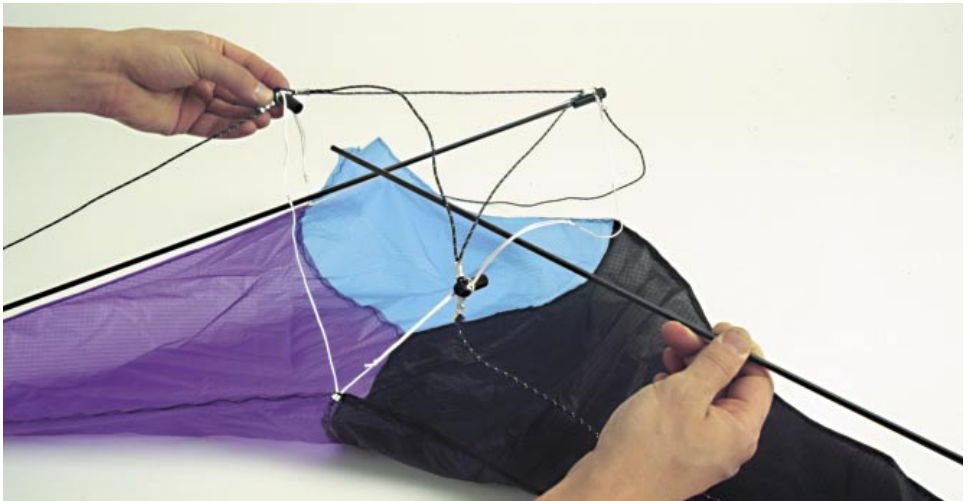
Then insert one end of this spar into a wing tip cap.

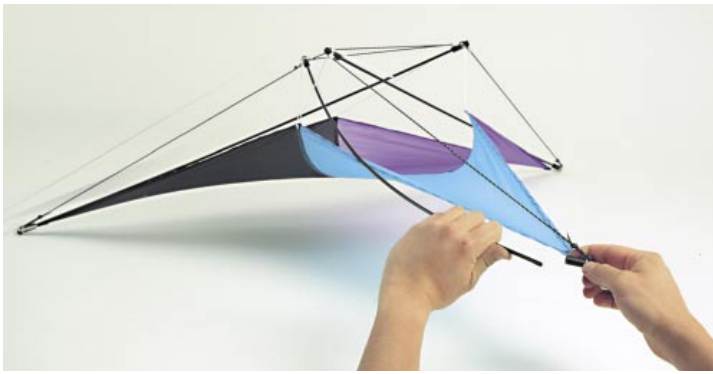
Making sure the spar is still underneath all the lines, and that there are no twists in the tension system, insert the other end into the cap in the middle section of the sail.



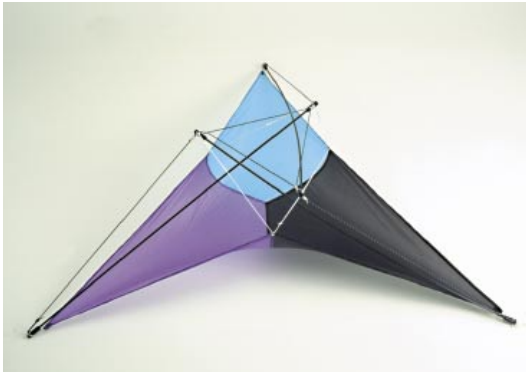
At this point there is only one possible cap to reach - the cap on the side opposite the wing tip at the other end of the spar.

Now insert another spar from from another wing tip, again passing underneath all the lines, but over the first inserted spar and into the cap on the side opposite the the wing tip the spar is already connected to. ( Note: your Synergy 333 will be very tight to assemble the first time or two, as the sail must stretch and take shape.)





Insert the final spar in place, connecting the last two remaining caps.



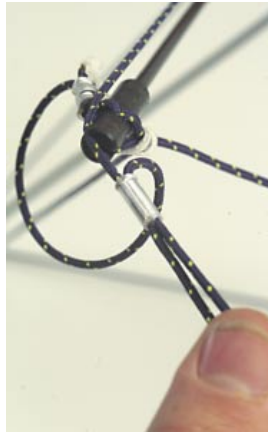
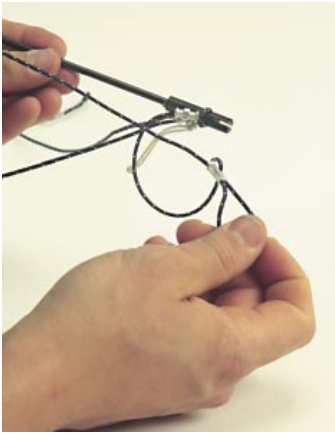
Your Synergy 333 is now fully assembled. None of the spars should be touching each other, each spar should follow a weaving pattern and when traveling down the spar from the center, the spar should first travel over, then under the other two spars. Check also to make sure there are no lines twisted around the spars.

### Assembling the 333 Tri-Handle

Pick up the 333 Tri-Handle by the main foam pad, letting the three legs dangle. Make sure there are no twists in the lines or around the spars. Slowly lower the handle onto a surface, getting the three legs to spread into a tripod.

When fully spread, double check for twist and find the two loose lines with crimped loops.





Take one of these two loose lines by the loop and pull the loop until the crimp is past the cap. You should notice a small notch on the end of the cap.

Insert the line extending from the opposite side of the loop from the crimp into the notch. Then do the same for the other line.

Your 333 Tri-Handle is now fully assembled.



right

Left- and right-handed setup:



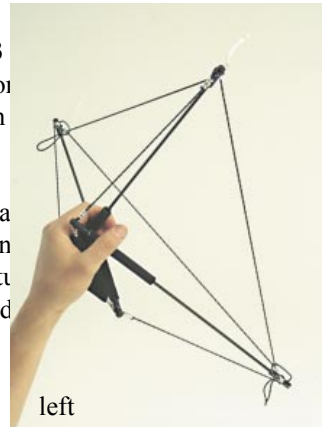
right

The Synergy 333 right hand version prefer to fly with two at once.

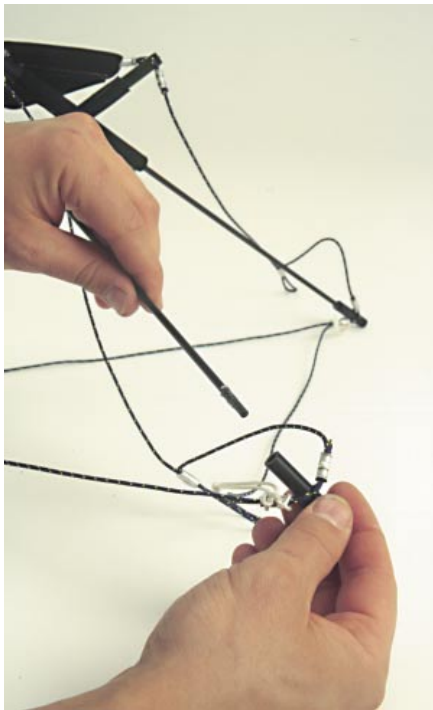
Switching the hand involves switching spars. These pictures show the transition between right and left hand setups.



left

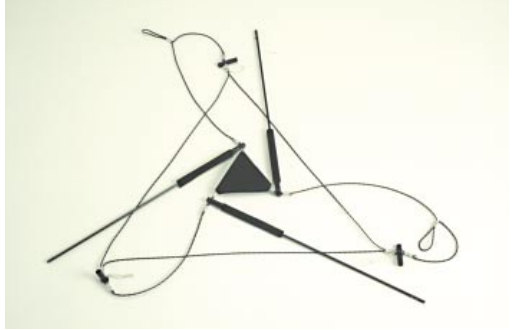


left

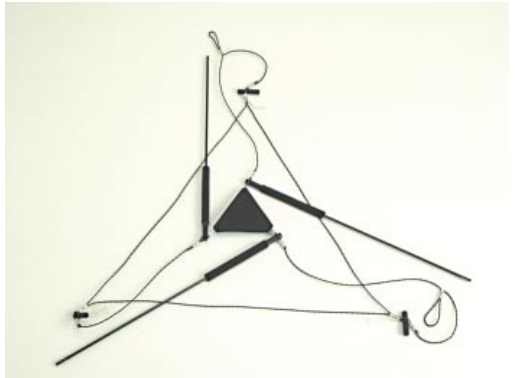


In order to change the 333 handle, first undo the tensioning lines by pulling the line out of the slotted caps (as if you were breaking down the handle). Then pull the spars out of the cap on the side opposite the grip.

Allow the handle to spread out on the table, and note the position of the parts.



Now rotate the grip 60° clockwise and the spars an additional 60° clockwise, making sure you move each spar in turn under the tension line running from the outer cap to the grip. Your handle should now have the following layout. You can now reinsert the spars into their newly associated caps. Then re-tension the lines (insert loop-lines into notches) and your 333 Tri-Handle is now in left-handed mode.



## When & where to fly

Try to find an open field with no power lines, or roads crossing through it. The more open and spacious the flying space, the better the wind. A building, hill, or big bank of trees at either end of your field will cause turbulence which may interfere with learning to fly. The smoothest wind you will find is that coming from a large lake or the ocean. Locate yourself as close to the center of the clearing as possible, as the smoothest winds will be there.

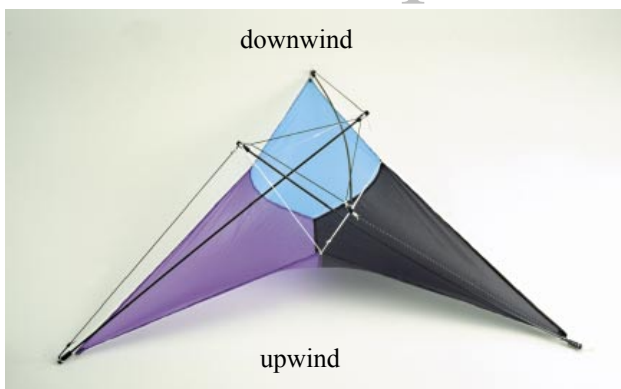
For your first time out you want a nice steady breeze of 8-15 mph (leaves and small branches

# Fly safe!

Avoid power lines, cars, roads and people. Don't fly near airports or in hazardous storm conditions.

should be moving, and flags flying fully extended). Too light wind will reduce the lift of the kite and make learning to fly more frustrating, and in strong wind the kite can move very fast, making it more difficult to learn, since your reactions have to be very quick. Also make sure that there are no thunderstorms in the area, as the lines when wet can conduct electricity. As you become more proficient with your Synergy 333 you can try flying in areas with obstacles and turbulence. These can make fun challenges and help advance your flying level.

## Field Setup



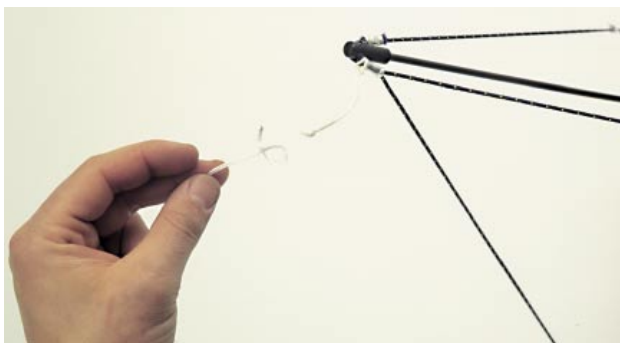
Lay your Synergy 333 so that one point faces downwind and two points face upwind, with the concave side of the sail facing up.

Pull out your lines and start unwinding the first few wraps. Then attach a line to each of the line attachments (a line with a knot) at the tips of the kite using a lark's head loop over the knot.

### How to tie a lark's head loop



Unwind your lines while walking upwind (backwards). Lay the line running to the tip facing downwind on top of the kite. Remember to bring your 333 handle!



Remove all twist from the lines so that they do not cross each other anywhere, and attach them to the line attachments on 333 tri-handle (again using the lark's head loop).



With your lines fully set up, take a few steps backward (upwind). As the top line (the one connecting to the downwind tip of the kite) becomes taut you will be to lift the tip of the kite up and into launch position.

# Flight

**Launching:** In order to launch the kite, give a pull back and up on the handle, so that the top of the handle is farther back than its bottom.

## Flight:

Your Synergy 333 is a direct control kite. In other words, the kite moves in the direction of whichever side of the handle you tilt back. Turn the handle and the kite turns.

Pay attention to the orientation of the big triangle on the tri-handle. This triangle mimics the flying attitude of the kite; when turning the kite, this triangle must maintain the same plane of alignment to guarantee the held position of the kite.

It is easiest to fly the Synergy 333 with two tips leading (two up and one down); this ensures increased stability and speed. If the kite begins to spin due to changing winds or sudden movement, follow its rotation with your wrist to keep control of the kite.

The world of high performance 3-line flying is relatively unexplored, so have fun, play around and find some new tricks! Try flying with a 333 in each hand!

## Wind Range:

It is best to learn to fly your Synergy 333 in smooth winds of 8-18m/h, or 12-29km/h. However, once you are more familiar with your Synergy 333, you can fly in winds from 5-30m/h, or 8-38km/h. In winds above 16m/h (25km/h) it is pos-

sible to flip your Synergy 333 around and have the convex side facing you. In this position the kite is slower and less responsive, which makes it ideal for learning in a high wind.

When you start to reach the top of the wind range in this position, occasionally a wind gust will come along and collapse the structure flat against the sail. You can generally get it to pop back by popping(back and forth) the handle. This in no way harms the kite but protects the spars from breaking.

You may further extend the wind range of the Synergy 333 by taking three hollow fiberglass spars at 27 in (68.5cm) and sliding them over the carbon spars.

# Glossary

agility- the ability to respond with quick and easy movements through the flexibility and stability of the kite. Synergetic Series Kites and their Tensegrity frames provide the perfect combination of flexibility and stability for total agility in kite flight performance.

airfoil- a surface that gains lift when air is run past it due to its shape. This shape usually has a curved cross-section like an elongated tear drop with the convex side facing up and the more rounded end leading.

angle of attack- the angle of a kite's wing in relation to the wind, controlling its position and movement.

carbon- the most basic and abundant molecule in nature. Carbon is easy to produce, poses no environmental hazards, is a very strong molecule for its weight, and bonds very well with epoxy for the production of compression materials (spars, sheets)

clean and dirty wind- wind with no turbulence, caused by obstacles such as trees and buildings, is often called 'clean' by kites. Dirty wind is turbulent, unpredictable.

compression- the force of pushing in from two ends on a material.

design science- the study and use of nature's principles of design and building. Knowing and understanding the possibilities of form, structure and movement, the design scientist analyzes the needs and goals of a particular project and searches for the most efficient and economic structure to satisfy those needs and goals.

downwind- the direction the wind is traveling in (going towards) ie. when you drop a leaf it blows downwind.

k upwind- the direction the wind is coming from. ie to walk into the wind is to walk upwind.

durability- the ability to withstand wear and tear. The Tensegrity framework of Synergetic Series Kites accomplish this with tough, plastic caps as their outer barrier – the sail is never directly exposed.

flexible wing control- first used by the Wright brothers to steer Kitty Hawk, the ability of the kite or air-plane wing to flex (twist) to control its movement.

flying lines- the tension lines (strings) that run between the handles and your kite, which on the Synergetic Series have been set precisely even to ensure the proper response of your kite to your control signals.

larks head- a loop system used to attach lines together which need to be removed and reattached, one end forming the loop or lark's head, the other tied in an overhand knot.

lift- the upward force created by the movement and angle of a kite.

line attachment- our term for the knotted loop attached to the kite's and handles' caps to which your

flying lines are attached by a lark's head.

ripstop- a pattern woven into cloth that greatly strengthens it without much additional weight, and helps to keep puncture holes from ripping.

k Ripstop Nylon- traditional high-tech sailcloth using woven nylon fibers and a plastic or silicon coating.

k Ripstop Polyester- the latest, greatest sail cloth using woven Polyester fibers and a plastic or silicon coating. The advantages of Polyester are its low stretch and slow fade (polyester has five times greater resistance to the harmful effects of UV light).

spar- a compression member (stick or strut) usually made of carbon or fiberglass combined with epoxy in modern kites, traditionally out of wood or bamboo.

k pultruded carbon spars- spars produced by running carbon fibers impregnated with epoxy through a die. The fibers in these spars run lengthwise; the spars can be made hollow, solid, round, rectangular, or practically any shape in crosssection. Pultruded carbon spars are strong, light and economical - their only weakness is that the fibers may split down the length of the rod when over stressed.

k micro carbon- a pultruded carbon spar that is solid in the center and usually under .25 in / 5mm

k wrapped graphite spars- spars produced from carbon fibers which are impregnated with epoxy and wrapped in a spiral around a mandrel(metal rod) which is removed after curing. These hollow spiral wrapped spars are the strongest and lightest way to produce a carbon compression member.

Spectra™- a smooth man-made high tech fiber with extremely low stretch, low weight, and high strength. All this makes it a great fiber for fly lines. The Spectra™ fiber is developed and produced by Allied Signal corp.

stability- consistent flight characteristics when exposed to different wind conditions. Synergy Decas™ have ailerons which permit air to flow out of the sides which locks the kite into position. The center panel flexes to develop a directional air flow that also channels the air during forward and reverse movement.

synergy- in principle, the whole equals more than the sum of its parts, i.e. the action/interaction of two or more parts produces an effect of which each part is individually incapable. The sum of the parts of a synergetic kite produce a higher effect of stability, response, and performance than that of an ordinary kite design.

tension- the force of pulling out on two ends of a material.

tensegrity - a system in which the spars do not touch each other, but are suspended in a continuous network of integrated tension lines. Tensegrity is the shortened form for tensional integrity. Tensegrity is one of the lightest yet strongest structural systems known and therefore makes a great kite structure!

tension suspended airfoil- the unique patented feature

of all Synergetic series kites in which the efficient shape of the airfoil is formed by the tension pulling on a sail which is suspended in a resilient shape.

tension system- the network of tension lines (strings) and caps connected to the sail of a Synergetic Series kite. This system holds the spars and controls the shape and flexibility of the kite.

wind range- the minimum to maximum wind speed a kite is designed to fly well in.

wind window- the term used to describe the possible flying range of the kite in reference to the kite flyer. This is always part of a sphere which is centered at the kite flyer, with the flyable area located down wind (if there is wind). The size in degrees of the window depends on the wind and the efficiency and shape of the kite. When flying in Zero Wind your window is 360° around you, and on bridges your window can extend almost 360° vertically above and below you.

Zero Wind- no available wind source to propel the

If you wish to find other information about kite flying, try the following:

- Talk to the store you got your kite from or to a kite store in your area.
- Talk to the kite flyers you see in your area.
- Contact the American Kite Flyers association:  
1559 Rockville Pike, Rockville, MD 20852 800) AKA-2550, (408) 647 8483
- Attend kite festivals and competitions.
- Pick up one of the kite magazines.
- There are also many good books on kite flying (check our bibliography for a few suggestions):

Bibliography on flight:

Hosking, Wayne., Kites, Friedman publishing group, 1994.

Streeter, Tal., Art that Flies, Daytona Art Institute, 1990.

Veen, Harm Van, The Tao of Kiteflying (the dynamics of tethered flight), Aeolus, 1996.

Periodical publications:

Kitelines - America

American Kite - America

Drachen magazine - Germany

Kite Passion - France (in english also)

## Replacement parts:

Synergy 333

spars:

# per kite - 3

length - 29.8 / 75.9 in / cm

type - Avia .180 Carbon

For parts, supplies and additional information contact your local kite retailer or Nova Design Group (see back cover for address).

kite. In these conditions you must use your movement and the efficiency of the kite in order to fly it. Synergetic Series Zero Wind kites, while designed for true Zero Wind conditions, are also great in light winds and because of their tensegrity-suspended structure can even be used in medium winds.

Bibliography on form:

Fuller, R. Buckminster, Synergetics (1975), and Synergetics 2 (1979), Macmillan.

Fuller, R.B., and Marks, R., Dymaxion World of Buckminster Fuller, Anchor, 1973.

Hertel, H., Structure, Form and Movement, Rheinhold, 1966.

Kapraff, J., Connections: The Geometric Link Between Art and Science, McGraw-Hill, 1990.

Otto, F., ed. Tensile Structures M.I.T., 1973.

Pearce, P., Structure in Nature as a Strategy for Design, M.I.T., 1978.

Thompson, D.W., On Growth and Form, ed. J.T. Bonner, Cambridge Univ. Press, 1961.

This manual will give you a short and concise introduction to the Synergy 333, the first high performance tri-symmetrically designed 3 line kite on the market. Topics covered include:

- assembly
- field set-up
- flight
- glossary of terms
- replacement parts

## designer profile

Marc Ricketts

A kite flyer from a very young age, Marc experienced the explosive development of high-tech, high performance sport kites and has been competing since the early 80's. Following his interest in design and structure he studied architecture at Pratt Institute in New York City. There the focus of his studies moved away from architecture to geometrical structure and stability - in particular tension structures. He applied this knowledge to aerodynamics, developing and patenting the "Tension Suspended Airfoil".

Marc released the Synergetic Series kites in the beginning of X94. Immediately recognized for their innovation, they were awarded "Best New Kite" from the Kite Trade Association, and "Best Multi Line Kite" from the Smithsonian Institute. With the recent introduction of his 3 line series, Marc continues to transform the kite world through innovative design.

Marc Ricketts' kites are being manufactured by Invento, so you can expect their high production quality. All the kites come with their own Ricketts-designed carbon-fibre handles and SpectraC lines.

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