

Wind beneath my wings

Stephen Whitesell/Naish Sails Hawaii

Such is the power generated by even the smallest of the award-winning surfing kite designs developed by Naish Sails of Hawaii that they come complete with a warning that nobody under 18 years of age should attempt to fly them. Naish says that it is unlikely that someone under that age will have sufficient body mass and weight to control the craft.

In recent weeks a 17 year-old Englishman, Chris Grimes, was testing what the daily press described as a 'stunt' kite. A brisk southerly wind took him by surprise, lifted him 25 feet into the air and flew him a quarter of a mile across a tidal inlet. He lost his trousers and some dignity in the process but was otherwise unharmed.

Twenty-plus years ago two British climbers on an expedition into the Andean mountains crossed ice-covered plateaus by strapping on modified skis and parascending equipment to harness the towing capabilities of the ever-present winds. One of their major problems? Stopping.

Free as air, treat with care

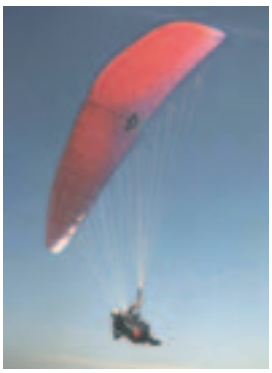
These instances serve to illustrate that probably the most freely available source of motive power - the movement of the air around us - requires careful handling, and the addition of practical experiences to ergonomically-based product design, to make the most of its potential. It is a researched fact that wind-powered sporting activities are on the increase as the existing markets for paragliding, hang-gliding and wind-surfing equipment are being complemented by the development of sophisticated traction kites. These last products add several dimensions to existing activities as well as providing a few options of their own.

The textile industry's interest lies mainly in the provision of yarns and fabrics to counter shock loadings and extension stress, ultra-violet (UV) degradation, moisture absorption, abrasion and puncturing. The use of rip-stop weaves is almost universal as is the specification of high-tensile fibres for the production of webbing and cordage.

"The thinking man's parachuting" is how the parascending and paragliding fraternities describe their sport - but not within the hearing of the local sky-diving club. Essentially both activities are the halves of one discipline - that of the use of a modified parachute canopy design to develop a controlled lift into the air, to manoeuvre appropriately and return to the ground safely. Parascending canopies are the subject of tow-launching, usually attached to a slow-moving vehicle or a motor-driven winch, whereby the lift generated is such that the canopy and pilot rise from the ground to a predetermined height (up to 250 metres or more with experience). The pilot can then release the towline, perform turns and manoeuvres and even aim for a small target on the ground as he returns to the landing site in a similar manner to a parachutist.

Ram-air wing canopies were originally developed for parachutists. They work by using moving air to pressurise a double-skinned fabric cell and maintain the wing shape which has an aerofoil cross-section; control is effected by lines connected to the trailing edges which configure them as drag ailerons to provide steering and braking. The design was quickly adopted by parascenders and modified to improve the lift to drag ratio. Subsequent sport-specific design has produced sleekly profiled canopies with high aspect ratios (aerofoil mean chord to span) which are faster and infinitely more manoeuvrable.

Mac Paragliders UK manufactures its paragliders in Eastern Europe. The company has recently entered the traction kite market with some success.





Mac Paragliders UK

These high-performance canopies need a sensitive control technique and careful handling in turbulent conditions - but they extended the sport into paragliding and gave the freedom of free flight.

Paragliding makes use of hill lift and rising thermals in exactly the same manner as fixed wing gliding. Self-launched from the top of a suitable hill (the warmer climes of southern Europe are the favoured areas for international competitions) the most experienced will stay airborne for many hours and complete flights of well over 100 kilometres.

In the majority of situations the favoured and recommended clothing is a one-piece flying suit, stout footwear and a glass-fibre helmet. In northern Europe the flying suit is likely to be in a breathable laminated fabric - flying in the rain is a non-starter, but there are those days when feelings of hope overwhelm reality.

Canopy fabrics are almost universally calendered nylon 6.6 in a rip-stop weave. Webs will be nylon with the added anti-abrasive qualities of DuPont Kevlar in many cases, with Dyneema from DSM High Performance Fibres or AlliedSignal's Spectra fibres forming the cordage and control lines.

Unlike parachute canopies, paragliders are only subjected to low level shock loadings and, as a consequence the stitching and construction techniques are geared to smoothing the passage of the airflow into the aerofoil cells and keeping the upper surface of the wing as smooth as possible. Depending on the manufacturer, the trailing edge and most of the underside seams will be tape strengthened - certainly those from which the rigging will depend.

Traction kites

The current upsurge in interest has been the development and application of so-called 'traction' kites; a progression from the potential of man-carrying models, which has also been satisfied to some degree by the development of paragliding canopies and hang gliders for free flight. Traction kites have evolved from two bases - the ram-air parafoil and the Allison/Scott sled kites of the 1960s. The former concept has already been described; the latter is basically a sail arranged as a scoop with parallel vertical spars giving stability. Modifications to this design can include semi-rigid leading edges to aid self-launching. Sail materials can be almost any impermeable material - strength and low-weight being the prime criteria.

The latest and most sophisticated product to use the sled design won a major international award at the Spring 2000 ISPO exhibition in Munich. Designed, developed and produced by Naish Sails of Hawaii, the Naish Kite replaces permanently rigid struts with inflatable bladders to provide vertical supports and a leading edge. The body of the kite is rip-stop polyester, with Mylar-laminated taffeta forming the struts which hold the replaceable latex-coated bladders. Control is by either two or four line bridle, according to choice or size of kite. The AR-5 model is mandatory four-line.

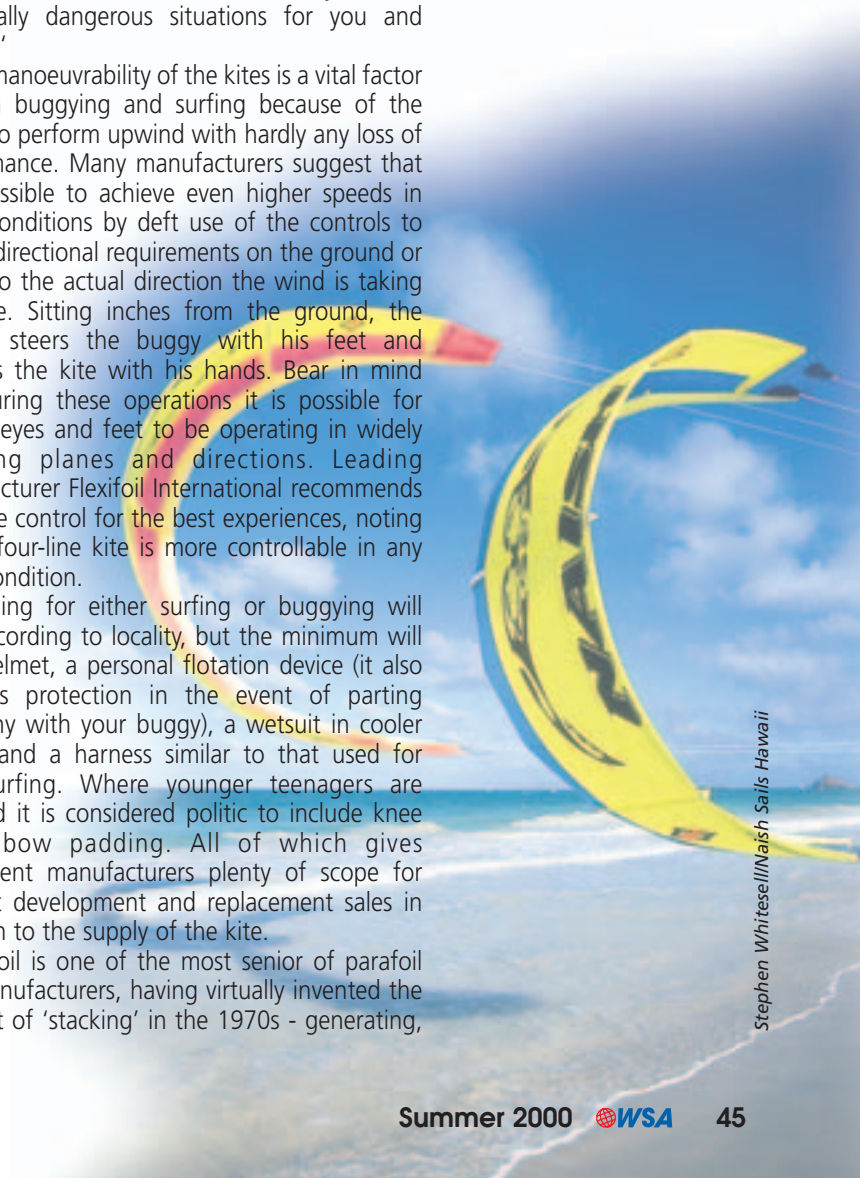
Naish Kites were designed to be used as an extension of wind-surfing, replacing the fixed sail and allowing a greater freedom in manoeuvring and acrobatics (or perhaps that should read 'aerobatics' since most of the moves take place several tens of feet in the air above the surface of the water). 'Kite-surfing' as the new sport is called has already experienced its first Air World Championship on the waters off Hawaii, when all the ultimate champions - male and female - were using Naish equipment despite a hefty turn-out of competitive equipment.

Despite its preoccupation with water-borne sports, Naish says that it is aware that the kite is being used to provide the power unit for para-karting (also known as kite-buggying) which usually takes place on long, shallow beaches which provide a good run-out. The majority of the kites used for this activity are of the parafoil variety - large, powerful units which command instant respect once the user feels the tug against his harness and through the control bar. US-based Flexifoil distributor Cobra Kite makes this comment: 'Respect for the wind is paramount. Be aware of its speed and strength. Be prepared for gusts as they can cause sudden loss of control of the kite, which may lead to potentially dangerous situations for you and others. '

The manoeuvrability of the kites is a vital factor in both buggying and surfing because of the ability to perform upwind with hardly any loss of performance. Many manufacturers suggest that it is possible to achieve even higher speeds in these conditions by deft use of the controls to match directional requirements on the ground or water to the actual direction the wind is taking the kite. Sitting inches from the ground, the activist steers the buggy with his feet and controls the kite with his hands. Bear in mind that during these operations it is possible for hands, eyes and feet to be operating in widely differing planes and directions. Leading manufacturer Flexifoil International recommends four-line control for the best experiences, noting that a four-line kite is more controllable in any wind condition.

Clothing for either surfing or buggying will vary according to locality, but the minimum will be a helmet, a personal flotation device (it also provides protection in the event of parting company with your buggy), a wetsuit in cooler climes and a harness similar to that used for wind-surfing. Where younger teenagers are involved it is considered politic to include knee and elbow padding. All of which gives equipment manufacturers plenty of scope for product development and replacement sales in addition to the supply of the kite.

Flexifoil is one of the most senior of parafoil kite manufacturers, having virtually invented the concept of 'stacking' in the 1970s - generating,



Stephen Whitesell/Naish Sails Hawaii





Flexifoil International

Left: Pure power - Flexifoil kites 'stacked' and under full stretch.

on several occasions, more than enough power to seriously worry the test team. The company tells the story of British sailor Ian Day who, in the 1980s, used a stack of six-foot span models to power his sail boat - and made it go very fast indeed. He then topped that with applying a similar system to a catamaran - and became the first sailor to stand a 'cat' on its stern under sail when the generated lift could not be reduced quickly enough.

A man who has been described as the current 'master of performance kite design' is New Zealander Peter Lynn. His company, called simply Peter Lynn Kites, produces a unit called C Quad - a four-line traction kite, of which Version 12 appeared in February 1999 - which it describes as '... an entirely new hybrid'.

Using a single skin supported by up to six glass fibre or carbon fibre rods in parallel to give form, the 'C' of the leading edge is shaped by another, curved, rod to maximise lift and promote air flow over the upper surface. Spectra fibres make up the control lines; the skin is Toray Chikara fabric, with the option of PC Icarex for the mid-range sizes. Peter Lynn comments that this design provides an exceptional lift to drag ratio throughout the series, and yet is capable of being mastered by almost anyone who can handle a control bar.

Polar winds

The world's only modular parafoil system has been developed by Welsh company Spider - which also specialises in supplying the equipment and appropriate training to expeditions as an aid to travelling purposefully. Known as Modulus, the parafoil sections range in size from 1 sq. metre up to 5.8 sq. metres and can be zipped together or unzipped to match the prevailing wind and climatic conditions.

When British explorer Roger Mear was planning an unsupported Antarctic crossing in 1995, he approached Spider for assistance in using parafoils to gain wind assistance to pull his sledge. During the preparation stage in 1994, Mear reported that the Modulus had enabled him to ski without the use of poles, to race a skidoo around a mountain - and win, to deploy the unit easily - even while wearing gloves, and to use the kite's lift to provide assistance in climbing steep slopes. In the event the expedition had to be abandoned after 42 days and 753 kms (468 miles). But the statistics speak for themselves. In one three-day period Modulus had taken Mear over 209 kms (130 miles), and it had assisted in over 50% of the total mileage. "Light wind performance was exceptional" to quote the final report.

The success of the Spider product in such conditions commended it to others, including the 1996 One Step Beyond expedition which proposed an excursion starting at the South Pole and travelling to the edge of the ice shelf - and to use parafoils for the entire journey. The team reached their target destination a full week ahead of schedule. They took 38 days to cover 1,657 kms (1,030 miles), and this included nine days where there was insufficient wind to generate traction. Modulus was well-proven.

Spider uses rip-stop polyester for the Modulus kites, which it says is the best option to meet the low water absorption and low weight requirements; again Spectra fibres form the control lines. The company claims the best power/weight/distance ratio on the market. An average Polar Modulus system weighs 2.5 kgs; the One Step Beyond expedition averaged 27 miles per day including the waiting days; the team members said that they could easily have travelled twice the total distance.

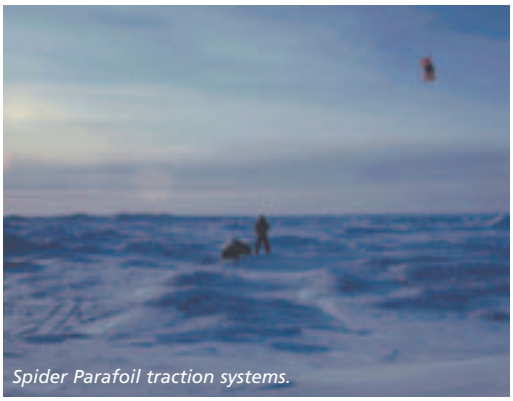
Hang-gliding has become increasingly popular since its inception in the late 1960s. A variation of glider soaring, the technique was perfected by Francis Rogallo - an American engineer who was also responsible for much of the development in kite design, from whence comes the basic design for a hang-glider. The sail wing is an aluminium frame covered with a skin of either nylon 6.6 or polyester sailcloth (the choice depends on the likely area of operations). The pilot is suspended from a trapeze-style frame in a webbing harness - nylon reinforced with Kevlar or Spectra fibres - which allows the use of the body as a counterweight to aid manoeuvrability. Personal equipment for the pilot includes a wind-proof suit, helmet, and a rapid-deployment emergency parachute.







Top Flight Sails - UK


Spider Parafoil traction systems.

Australian Graeme Joy at King Christian Island in the North-West Passage - sailing in a 20-knot wind. He later completed an unsupported trek to the Magnetic Pole under wind-power.

Winterised

Snow sports and wind power fit well together. Parakiting on skis or a snowboard - usually referred to as snow-surfing - has been available for ten years or so, and ice-yacht sailing can be traced back to the late 19th century in the Northern hemisphere.

This last activity received a fillip in popularity with the development of windsurfing in the 1960s. Sails and mast were easily rigged to a lightweight sled equipped with steerable skis in winter; the first official World Ice and Snow Sailing Championships were held in Helsinki in 1983.

And it is to Finland that we look for the next move in the wind-powered sports story. In 1987 the Finnish ice surfer Sami Tuurna developed a symmetrical 'free' wing which enabled him to use it as a flying rig controlled by the user with hands and applied body mass. No mast. No control lines.

Skimbat, as the wing was named, can be used with downhill or cross-country skis, with a snowboard or with skates. It has been used in every sort of condition from sea ice through to snow covered open moorland - and has even been used to scale the Ylläs summit in Lapland under wind power. The manufacturer, Skywings Limited, says that Skimbat can also be used in summer conditions with in-line skates or a mountain board.

The wing fabric is either Dacron polyester or a combination of monofilm and K-ply film tensioned with glass fibre tubing. The latter material allows wingsurfing down to minus 30°C if one is so inclined. In similar fashion to a windsurfing rig, there's a boom and a short right angled spar which provides all the control functions needed. The wing tips are protected from impact damage by epoxy reinforced glass fibre profiles which also serve as tensioners for the wing as a whole.

Skywings says that a skilled wingsurfer can handle the rig in wind speeds up to 20m/s and can reach speeds of 70 to 100 km/h (44 to 62 mph). Jumps and even short glides are possible - with a 40 foot 'stride' well within average capability. Patrick Blom, a 21-year-old economics student from Helsinki, currently holds the unofficial distance Skimbat record with a 'flight' of 170 m.

Sheets to the wind

The advent of windsurfing, or to be more specific - the development of a mast and sail capable of being mounted on a surfboard - took waterborne man one giant wave forward in terms of thrills, spills and adrenaline pushing.

It had been foreshadowed of course by the early landsailing and sand yachting equipment - and that had first appeared in the late 19th century. The inventors of those craft had drawn their inspiration from small dinghies and yachts; an early picture even shows a land sailor with a lateen sail which apparently totally obscured the forward vision. However, this was in Western Australia where they have more open territory than most.

The windsurfer sails brought the whole thing full circle. Here was a lightweight product, similar in design to a yacht's mainsail, usually with monofilm panels which gave peripheral and forward vision - and all it needed was application to an equally lightweight chassis equipped with either wheels or snow runners to bring landsailing back to the fore of wind-powered sports. Sail-equipped craft have many forms, varying from a simple chassis suitable for a day's sailing along beaches through to speedsters capable of nearly 100 mph and destined for the record-breakers of this world.

The ice-yacht or snow-boat partially owes its origins to Polar exploration and those long months spent waiting for the short summer to arrive. Diarised reports include mention of ship's boats being adapted for snow travel by the addition of ski runners. The latest manifestation of this activity comes from Englewood, Colorado USA, where Ice Flyer LLC has its headquarters.

The Ice Flyer is a 'sail behind the pilot' design on a 3.65m (12 feet) by 2.43m (8 feet) chassis equipped with snow runners. The manufacturer says that almost any windsurfer sails can be fitted, although it obviously has its own design as part of the package. CEO Clay Thomas says of his first developed Ice Flyer: 'After several minutes of upwind turns I decided to try a jibe (gybe). Turning downwind produces more speed, more adrenaline and more fun. This thing corners like a Ferrari!'

Derryck Draper

Patrick Blom, the unofficial world record holder, demonstrates his Skimbat 'flight' technique.






Skywings Limited