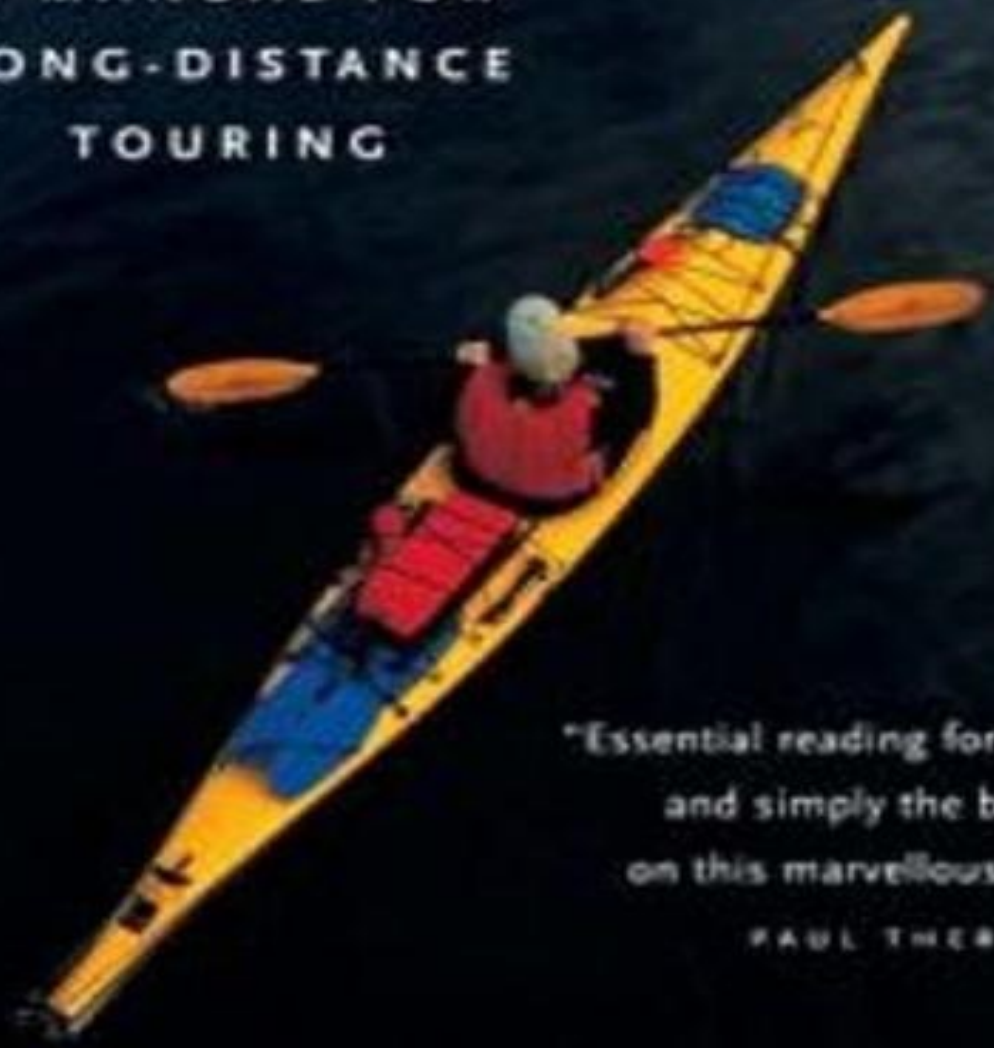
Sea Kayaking

UPDATED REVISED 5TH EDITION

A MANUAL FOR LONG-DISTANCE TOURING



"Essential reading for all kayakers, and simply the best book on this marvellous pastime."

PAUL THEROUX

John Dowd

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To Paul Souter, who provided the plans for my first kayak

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Introduction

Who would have thought, when I first dropped off the manuscript for *Sea Kayaking* at the offices Jim Douglas and Scott McIntyre back in 1980, that there would ever be a fifth edition? The "spor wasn't even called sea kayaking; we picked that name for the title of the book to make it clear that v were talking about neither paddling on rivers nor using canoes. Sea Kayaking had a nice ring to it, ar the name fit much better than coastal paddling, blue water kayaking, sea touring (in what?) or ar number of other less precise options.

Sea kayaking has long topped the list of fastest-growing water sports. There are still more peop padding canoes and aluminum boats, but sea kayaking is where the energy is. Recently I returned the kayak industry after some years away from it writing children's books and home-schooling m two children. I found that much had changed during my absence. For a start, many of the small playe have grown big, some gobbled up by very large fish indeed. Manufacturers such as Perception, Necl and Wilderness Systems have been bought out by multinational corporations that have seen bi business opportunities in sea kayaking. The competition between these giants has been fierc Fortunately the vitality of the small builders remains and the quality of boats is noticeably higher.

Sea kayak instruction has also become a thriving industry, but like many educational systems, has largely focussed on those aspects of the activity that can be most readily taught and measured- such as paddling skills and rescue techniques—rather than on subtler, less tangible skills such judgement, sound seamanship and good risk management. Sea kayaking as I know it is roughly 80 p cent seamanship skills (weather assessment, navigation, knowledge of oceanography, reading of tid and currents, group assessment, coastal survival techniques, etc.) and less than 20 per cent boa handling skills (turning, going straight, rolls, rescues, etc.). The reverse is true only if all yo paddling is done in sheltered waterways.

In addition, some inappropriate crossover skills have found their way into sea kayaking fro racing. It has become fashionable, for example, to paddle a sea kayak as if it were a seven-kilogra racing shell, with a high, exaggerated "chicken wing" box-style stroke and racing paddles. It is stroke that works brilliantly if you suddenly need a burst of power, but I know of no one who ha paddled a loaded sea kayak for a thousand miles and maintained such a style. Yet it is being taught b skill-focussed paddlers as the stroke of choice.

British Columbia is ideal kayaking country. *Tofino Expeditions*

It has been personally gratifying to watch sea kayaking go mainstream and to know that I hav contributed to this trend. Yet at the same time, I can't help but regret the loss of innocence, a tim when the sight of a sea kayak on the roof of a passing car was excuse enough to pull over and chat. F paddlers, it has been a period of much learning and relearning, and the threads of knowledge an communicable experience have formed a rich tapestry. Books on the subject have proliferated—an improved.

Early editions of *Sea Kayaking* to date have sold nearly 60,000 copies, but this is hardly a adequate measure of existing interest in kayak touring. Whereas the only books available on th subject at the time of the first edition were Adney and Chapelle's *Bark Canoes and Skin Boats North America* and a few British "canoeing" manuals that drew heavily on river experience, toda dozens of manuals and trip narratives line up on kayak shop shelves. There are instructional videc and numerous guides telling you where to paddle or how to camp, forage and cook when you get ther together with the definitive work on kayak navigation by David Burch, *Fundamentals of Kaya Navigation,* and the eminently readable *Sea Kayak Navigation Simplified,* by Lee Moyer. There ar now several specialty magazines, and articles on kayak travel adventures are no longer rare in th mainstream press. The sea kayak has been adopted by the advertising industry as the ultima "freedom" accessory.

Much has been printed on the history of kayaking, thanks to the research of the late John Heat David Zimmerly, George Dyson and Eugene Arima in North America, H.C. Petersen in Greenland an John Brand in England. It is clear from their research that the best traditional Native kayaks we extremely sophisticated, well-designed craft from which our modern-day builders have learned a gre deal yet stand to learn much more. Once again in this edition I have resisted the temptation to dabb in the world of kayak history, which I consider to be beyond the scope of this book. We are heirs to long and complex tradition, one without surviving masters—just students, evidence and memories.

There is now, as there was long ago, a kayak for almost every purpose—from the slender We Greenland–style boats, originally designed for hunting among ice floes, to the 6.5-metre (21-foo touring double or triple that cruised the Pacific coast. Each has its own merits and limitations, an each its band of dedicated advocates. My personal preference for a touring single is a room relatively stable craft about 60 centimetres (24 inches) in the beam. Although I would pick this f solo coastal cruising, it might not be my first choice for day paddling off Hawaii, and I would want y another craft for cruising with young children. It is this very diversity of boat design that makes s kayaking so overwhelming for the first-time paddler looking to choose the right boat, and it is one the objectives of this book to help clarify the kinds of choices that should be made.

Indonesia. *John Dowd*

I have based this book mostly on my own experience, but occasionally it has been necessary for m to write beyond what I know firsthand to present a more balanced picture of sea kayaking whe covering such topics as obscure methods of rolling and kayaking in sea ice. I have gratefully calle upon the expertise of others, among them the late John Heath, whose knowledge of tradition kayaking techniques was first highlighted in Adney and Chapelle's aforementioned classic.

Because the knowledge required for sea kayaking is so encompassing, I have also frequently chose to omit the general in favour of the specific. For example, my chapter on first aid ignores suc essentials as cardiopulmonary resuscitation (CPR) and the treatment of bleeding, since these are we covered in general publications on the subject. It focusses instead on kayak-related ailments. I tru the reader to know the basics already—for know them he or she must when embarking on a s journey.

Navigation, camping and general survival are other areas in which I have assumed that the reader not a novice. The information presented here is geared to kayaking situations and seen from th viewpoint of a kayaker, focussing particularly on those problems most likely to be encountered o

long kayak journeys. If you need specialized survival information, books such as the *SAS Survi Handbook* do the subject justice.

I have attempted to make this fifth edition useful for paddlers of all levels, though with emphasis on the more ambitious paddler. For blow-by-blow basics, I recommend Shelley Johnson *Complete Sea Kayaker's Handbook,* which covers in detail much that I take for granted. The need f useful answers to kayaking problems usually calls for illustrations that provide lessons valuable both the beginner and the experienced paddler. In most instances I have elected to present advance examples in preference to basic ones, in the belief that beginners' lessons are contained within a advanced situation but not vice versa. This is not to imply that paddling storms or wild lee shores undertaking 20-mile crossings is the norm; it is not. Indeed, I counsel strongly in favour of a measure approach to new kayaking experience. It is my hope that this book will provide a vision of what possible to those who bring an adventurous spirit to their kayaking.

Note: Miles in this book are nautical miles unless otherwise stated.

Laguna San Rafael, Chile. *John Dowd*

01

Equipment

THE BOAT

Sea kayaks are distinguished from river kayaks by a multitude of features for which we have on word: *seaworthiness*. A sea boat may or may not roll easily, but it must slice through or ride ove waves of all sizes, track dependably regardless of the direction of the sea, respond to the paddle windy conditions, carry your gear and stand up to continuous punishment from wave action, weathe sand, rocky beaches, sea ice and sometimes very large, very inquisitive fish.

Nevertheless, there are many types of boat to choose from, and every dedicated kayaker is his her own best authority on “the best kayak.” You have to choose the right one for your use. There ar dozens of manufacturers as well as numerous designs for home-built kayaks in modern or tradition styles.

Most sea kayaks have a sharp prow and an angular or even knifelike forefoot. Amidships, the hu is either chined or rounded, with some flattening in cross section. Farther aft, the cross sectio resumes its rounded V shape, and the stern itself may be as sharp as the prow. As a rule, sea kayak have moderate rocker (the curvature upward of the keel-line towards stem and stern as the boat viewed in profile). This enhances the manoeuvrability of the craft. A deep, sharp stern allows the bo to track through the waves without yawing under the alternating thrust of the paddle. The rounded section amidships allows the boat to lean smoothly into breakers or helps carve a turn, and the parti flattening under the cockpit increases stability. A high prow is found in some designs, including man of the surviving or recorded Inuit and Aleut boats. Such a bow adds buoyancy forward and may hel reduce weathercocking in some designs. It can be a useful feature in ice but is of questionable value open water and today is probably included more for appearance than for function. As alread indicated, in some hulls you will see chines. These are ridges, angular in cross section, runnin lengthwise along the hull between gunwale and keel. In fabric or skin-covered boats they are cause by the tension of the skin across a framing rib; a similar feature is sometimes moulded into fibregla boats such as models where the chine aids turning or provides a shoulder of stability when the boat leaned to one side.

Drawing heavily on sailboat design, Matt Kirk-Buss has come

up with some refreshing and successful turns of design in his Loki sea kayaks. *lokikayak.com*

Slalom kayaks, designed for quick turns in rivers rather than tracking at sea, have much mo rocker than a sea boat, and their hulls are generally flatter in cross section amidships and considerab rounder at bow and stern. They are also shorter. A river boat is often used for surf kayaking and whe fitted with a skeg or rudder will sometimes serve for a short sea voyage, but the compromise is n finally a happy one. Away from white water, it is better to have a kayak true to the ancestry of th craft: a boat designed specifically for the sea.

Narrow touring kayaks

Narrow touring kayaks are usually single-seaters between 5 and 6 metres (17 and 19 feet) long wi a 46- to 58-centimetre (18- to 23-inch) beam. They commonly have a rounded hull, hard chine moderate V hull with varying amounts of rocker. Essentially they are coastal craft, and a paddler usi them in wind or open water should be comfortable with the technique of rolling. These boats depe on the skill of the paddler for their seaworthiness. They are, in essence, tippy. (Tippiness, however, a relative term. How tippy a boat is depends on the paddler's familiarity with that type of kayak well as on the paddler's weight distribution: a broad-shouldered man will have many more proble with balance than a lightweight woman with solid legs and hips, since most of the woman's weig will be close to the centre of gravity.)

The West Greenland and Aleut kayaks were made from sealskin with a fragile wood and bo frame, but today the most common boats in this style are plastic, fibreglass or Kevlar. Although thes 50- to 56-centimetre (20- to 22-inch) beam kayaks have been used on some impressive coastal trip most notably the circumnavigations of New Zealand, Britain, Australia and Japan by Paul Caffyn a the circumnavigation of the Hawaiian Islands by Greg Blanchette, they are usually best suited for da tripping and lightweight excursions because of their small volume and rather wet ride.

The great advantages of narrow touring kayaks are the ease with which they can be rolled and the speedier hulls. The most obvious disadvantage besides their limited stowage space, which makes the less suitable for journeys on which food and equipment must be carried in quantity, is the fact th they are neither stable enough nor roomy enough to provide real relaxation, or even to serve as platform for photography. They are deadly if their occupant becomes exhausted or incapacitated at s in severe conditions, unless rafting up is an option or external flotation is added.

Chris Duff, paddling the Romany touring kayak he chose for his trips around Ireland, Iceland and th

South Island of New Zealand. *Courtesy of Chris Duff*

Paul Caffyn in his modified Nordkapp. Paul is in a paddling class of his own with trips around New Zealand, Australia, Japan and Great Britain as well as large sections of the coasts of North America and Greenland to his credit. *Courtesy of Paul Caffyn*

At the fringe of what can be considered a sea kayak—and not part of the focus of this book—a the various specialty boats used exclusively for ocean racing, surfing or just mucking about casuall Most distinctive among these is the surf ski, a long (6.5 metres, or 21 feet), narrow (48 centimetres, 19 inches) kayak designed for sitting on rather than in. A foot-controlled rudder assists the paddler following seas and cross winds, while a quick-release belt keeps the paddler in place duri turbulence. Not surprisingly, surf skis are mostly used in the warm waters of Australia, South Afric and Hawaii. The most famous race for this class of kayak is the annual escorted downwind dash acro the channel from Hawaii's Molokai Island to Oahu Island, with an average speed that sometim exceeds 8 knots. In the Pacific Northwest and the Great Lakes, a new breed of sit-in ocean-raci kayak has evolved to give an edge to competitors. This craft is best described as a cross between downriver racing boat and a sea kayak.

Another wrinkle to kayak design for the sport of surfing has been the evolution of the wave ski. T call this planing, hulled, sit-on board a kayak is stretching the definition of the word, but son manufacturers show bikini-clad women paddling them with a beer cooler secured to the stern! In the element on the face of a 3-metre (10-foot) Hawaiian breaker, however, these stubby little craft a clearly the end product of a very specialized line of evolution, and they make surfing in a tourin kayak look like trying to ride a log to shore.

General touring kayaks

The general touring single-seaters are much more prevalent than their narrow counterparts. The are generally shorter—between approximately 4 and 5 metres (14 and 17 feet)—and feature a beam about 58 to 69 centimetres (23 to 27 inches), yet some have a grand 80-centimetre (32-inch) beam a are so stable you can stand up in them. The greater stability of general touring boats enables you rest and relax in them, though in extreme cases it tends to discourage the learning of more advanc paddling skills. These boats generally have a greater load-carrying capacity than the narrow singl and give a much drier ride. But because they are designed to be paddled loaded, their higher profi can make them vulnerable to wind when empty.

The beamier singles are usually not as fast, maybe a half-knot slower than their skinnier brethre and are more difficult to roll, but then they are far less likely to require rolling.

Having clearly defined two types of singles, narrow and general touring, I will now muddle th distinction by pointing out that there are a number of crossover models that could almost be placed either category.

Crossover kayaks

The immediate ancestor of the hardshell cruising kayak, single or double, is the collapsible kaya or foldboat—a design pioneered by the German tailor Hans Klepper around the turn of the century an itself based on original boats from the Canadian Arctic. The German models were originall manufactured for lakes and rivers. They have long since lost their pre-eminence in the field hardshell kayaks of fibreglass and polyethylene, but because some of these collapsibles are suitab for use on the open sea and are convenient for travellers, they have continued to be popular in Europ and North America.

Unlike the Native peoples of Northern Canada and Greenland, who used single-seat kayaks f inshore hunting, the Aleuts of Alaska designed two-seat models for longer, more exposed voyage These boats were given a third cockpit at the instigation of Russian fur traders and named *baidarka* They were used for hunting and trading voyages east of the Aleutians and as far south as Ba California. Today the closest approximations to the larger Aleut craft are the *baidarkas* built b George Dyson of Bellingham, author of the book *Baidarka* and founder of the Baidarka Historic Society. Using modern materials—chiefly nylon cloth and aluminum tubing—Dyson has built sever kayaks with many of the original *baidarka* features. His triple-seater is 8.5 metres (28 feet) long wi a 76-centimetre (30-inch) beam. It is very stable and can carry a sail. Dyson’s experimental fan sa design is most original: ashore the sail can double as a tent. Like its predecessors, this *baidarka* ca carry some 270 kilograms (600 pounds) of equipment. Apart from the materials used, its greate departure from traditional design is a sturdy foot-controlled rudder.

A Feathercraft folding kayak. *Joel Rogers*

The *baidarka* is one of the principal models that defined today's modern kayaks. This replica, built b
Ben Fast, is the famous Unalaska design. It was originally built as a single and was converted to a
double. *John George*

Recreational kayaks

During recent years a third significant class of kayak has evolved. These generally short, stab
little craft are often referred to as recreational kayaks (or rec-boats). Their two outstanding virtues a

their price and their small size, which makes them ideal for carrying aboard sailboats as tenders an for mucking about off calm beaches and on ponds and lakes at the cottage. At this writing, they hav one major flaw, however, and it is one which I suspect will return to haunt the manufacturers in th future: the absence of adequate built-in buoyancy. For that reason by no means should they b considered for the sort of trips that are the subject of this book. That said, they are frequently fi functional kayaks within the limits for which they were designed.

CHOOSING A KAYAK

Choosing the right kayak is like buying any other large-ticket item: the world suddenly becom full of instant experts eager to give you advice and warn you of the pitfalls of this or that featur Buying on the secondhand market is, of course, usually cheaper but fraught with dangers unless yo know precisely what you are looking for. If you seek the advice of friends, you will usually buy th same boat as they have because they have grown to love theirs and can sing its praises loud and clea they also have an investment in reassuring themselves—and you—that they made the right choice the first place.

By doing the round of designers, you will quickly realize that the so-called experts can disagr spectacularly on such fundamental features as the shape of the bow. I once heard a design (redesigner might be a more appropriate term, since most design today is simply a modification existing design) being asked why he had put a long upswept bow on his kayak. He explained that was to stop the boat from pearling (nose-diving in following seas). The customer thought about th for a while and then asked why the other boat he had built had a low bow. That too was to sto pearling, the designer explained a little sheepishly. Certainly there are few clearly right or wron features—mostly trade-offs and preferences.

Probably the best way to choose a kayak is to visit a sea kayak symposium, one of the major s kayaking clubs or a specialty store offering a wide range of models. At the store, seek the gener guidance of a sales clerk but don’t listen too closely to anything the person tells you about how a bo handles—just take it out and try it. The problem with this approach, however, is that most beginne prefer a very stable kayak for a start; later, as they become more skilled, the stable boat could fe dull. So rent some kayaks with an eye to purchasing. You may still choose the stable boat in the en but it won’t be because you are afraid of the others.

Before you can expect to make sense of the hundreds of models of kayaks now available on th North American market, indulge in a little fantasy. Cast your mind back to the genesis of your intere in sea kayaking, that dream of how you see yourself in a kayak. Maybe it is a weekend tryst to the fir secluded cove you and your partner come across; or maybe it is a King Farouk–sized challenge nature with just you and your little boat duelling the ocean creamers; or maybe you wish to use th kayak for wildlife photography or an evening workout. Got the image? Well, hold on to it, becaus now you have to use that image to find the right boat.

Unfortunately, there are at least two other factors that will complicate your choice: your budg constraints and your partner’s or partners’ sizing needs. Today there are singles, doubles, foldin boats and rigid ones built of fibreglass, Kevlar, plastic, canvas/lath and nylon/aluminum tubin plywood and cedar strip. There are both cheap and expensive kayaks, but it is the variety and quali of the new boats that sets them apart from those of ten or twenty years ago.

Singles

The most popular sea kayaks are rigid singles—the freedom boats for those who seek independen or who are obliged through circumstance to paddle solo. Rigid singles are also the group with the mo diverse designs, so the chance of finding the perfect boat for you is greatest in this category. Couple however, should keep in mind that two singles will likely cost considerably more than a two-seater.

Doubles

A double is particularly appropriate if you and your partner are of significantly different strength if the trip you plan is extremely arduous or if you are going to a remote area. After all, you cann easily become separated from a companion in the same kayak, and two paddlers in a double a certainly a stronger unit than the same two paddlers in singles. Few doubles can be successful paddled by one person under difficult conditions, however, with the exception of the downwind ocea crossings in which Hannes Lindemann and Ed Gillet chose doubles (see Appendix A).

High volume or low volume?

A high-volume single kayak is one with a volume of around 500 L (18 cubic feet), while a lov volume one runs about 285 to 340 L (from 10 to 12 cubic feet); there can be appreciable volum differences between two-seaters as well, but not to the same extent. Choosing the right-sized kayak not quite as straightforward as choosing a pair of shoes, since most people select a kayak for the loa it carries as well as for its fit. Others have a clear and unshakeable, preconceived idea of what a kaya should feel like, and they know exactly when they feel it. But choosing a kayak as you would a shoe a pretty good place to start, since generally if you are a small person (under 68 kilograms, or 15 pounds), you will prefer a small boat, and if you are a larger person (say, over 80 kilograms, or 18 pounds), you are going to feel more comfortable in a larger boat. If you had no special load-carryin considerations, you would buy roughly according to such sizing.

For people who are 5 foot 2 inches and sport a pair of size 14 feet, the rule of thumb breaks dow You need a bigger boat to accommodate your tootsies. Even if you have no unusual physic attributes, you may choose a higher-volume boat so that you can carry plenty of fresh food along o your trip, or a few bottles of Chablis, or a box of camera equipment. People who fish for salmon fro their kayaks should consider what they would do if they hooked into a 30-pounder. (They will be gla of the extra stability that usually comes with a higher-volume kayak and may judge the trade-off good one.) Those who feel stiff-jointed and awkward getting into a kayak may also be glad of a litt extra clearance in the cockpit and deck area.

Conversely, there are 190-pounders who get a great kick out of paddling fast in a sporty kaya eating freeze-dried food and having waves wash over them every few seconds. They have absolute no interest in taking pictures from a kayak unless they show crooked horizons intersecting th uplifting profile of their kayak midframe. For these people, too, the rules of high- and low-volum choices are accommodatingly elastic. If, however, you find that you are obliged to pile gear on dec because your boat’s interior will not accommodate your needs, or if you find that you are viewing th waves from the wrong side more often than you should, try a higher-volume boat with a more stab

hull.

Rigid or folding?

Put simply, you should choose a rigid kayak unless you need one that folds. Or you may prefer th aesthetics of a boat with the traditional internal frame—a boat that performs as silently as the origin hunting craft and flexes in the waves like a living thing.

The advantages offered by rigid kayaks are numerous: for a start, there are more of them, so th chances of finding the right boat for your needs is going to be greater; they require less maintenanc less care around rocks and less concern about the effects of the elements; they are also usually muc cheaper. They also have more room for gear, since there are no frames to get in the way.

The reasons for buying a folding kayak, however, are often as compelling: you may need to brea down the boat for travel or to store it in an apartment. Such craft literally promise you the world kayak touring in a backpack—Japan, New Zealand, the Aegean, the Caribbean . . . The price for th versatility is not just measured in dollars; you must nurse your folding kayak over coral or barnacl encrusted intertidal zones and wipe the sand off your feet and bags before placing them inside, sin grit beneath the stringers will chafe the hull, rub away at the varnish or jam up the joints of a aluminum frame. Folding kayaks are simply fussier to own and maintain, something to think about you reach for your chequebook. Assembly time for most folding kayaks is a fairly modest fifteen thirty minutes once the learning curve has levelled out.

Those who require more compactness than they would get from a collapsible kayak might consid the purchase of an inflatable kayak. (Audrey Sutherland of Hawaii has forced sea kayakers to tal these stubby little craft seriously by paddling more than 12,000 nautical miles of British Columb and Alaska coasts, Norway and Hawaii in one during the past twenty years.) Apart from bein lightweight, inflatable kayaks are the least expensive of folding craft.

Audrey Sutherland, paddler extraordinaire, in her inflatable kayak. *Courtesy of Audrey Sutherland*

For those who strongly prefer rigid kayaks yet need to reduce their overall length for storag several manufacturers produce take-apart rigid boats. These boats, however, tend to be heav expensive—since, to minimize weight, they must be made of Kevlar—and prone to difficulties whe they join.

Materials

Fibreglass kayaks are usually a combination of cloth, roving and, in some of the more cheap constructed models, chopped matte. Matte provides stiffness and, when it is thick enough, strengt but results in a heavy and somewhat brittle hull. Most builders now use foam core or an internal ke of either foam or spruce to gain the hull rigidity required for strongly secured bulkheads and optimu kayak performance. The really high-tech boats are built with an initial layer of fibreglass cloth improve abrasion resistance, followed by layers of Kevlar well stiffened with carbon fibre. Such boa are lighter, stronger and more expensive than their equivalent fibreglass models. Standard weight for fibreglass kayak is around 25 kilograms (55 pounds) for a single and 40 kilograms (90 pounds) for double.

The resin preferred by most fibreglass kayak builders today is vinylester, which is more flexib than the cheaper polyester resins and not as toxic as the tough epoxy resins. Most fibreglass kaya are protected with a hard abrasion-resistant layer of gelcoat. This is the first layer to be sprayed in the mould and carries the pigment, which helps protect the resin and fibres from the damagi ultraviolet rays of the sun. Most kayaks come with a white hull, since white shows the scratches le than a dark colour. White does not, however, stand out well when the kayak is upside down ami breaking waves. The choice of colour for the deck depends on whether you want to stand out or ble in with your environment. The best colour for visibility is yellow, and the most visible boat is one th is yellow top and bottom.

The rotomoulded polyethylene kayaks are stronger and more economical than fibreglass model though not so abrasion resistant. (They should not be dragged, since effective repair is problematic Two principal types of material are used: linear polyethylene and its tougher, stiffer and more cost cousin, superlinear polyethylene.

The disadvantages of these polymer kayaks are that they are heavier (by about 4.5 kilograms, or 1 pounds) than most fibreglass models, and they scratch more severely than gelcoated fibreglass. The seem particularly vulnerable to denting on roof racks in the hot sun, but dimples can usually b popped out with a stick wedged inside the boat or with the selective application of boiling water. Th life span of polymer kayaks, UV inhibitors notwithstanding, is usually less than that of fibregla kayaks, though the life span is going to vary greatly depending on the care taken when you store th boat. When they are kept outdoors, these boats should be wrapped in a protective tarp to minimize U damage.

Rotomoulded kayaks are made in an expensive nickel, steel or aluminum mould that is heate usually in a gas oven, and then opened to receive a measured amount of plastic granules. This is whe science ends and art begins; the mould is then rotated slowly and rocked end for end in such a mann that the melted plastic runs to an even thickness over the inside of the mould as it cools. As the new formed boat cools, it contracts and must be handled carefully until it has set in its final form. Blo moulding, an even more costly process used by Prijon, uses a denser plastic that results in a stiff boat that will last longer and may be welded.

Polycarbonate kayaks are now on the market thanks to the experimental work of Eddyline. They a made from polycarbonate sheets that are heated into a mould, sometimes combined with layers fibreglass or Kevlar. These boats tend to be priced somewhere between fibreglass and polyethyle and weigh a little less. They are less expensive and stiffer than boats of regular composi construction, though there are some size and form limitations due to the nature of the polycarbona sheets.

Wood kayaks are a fast-growing part of the sea kayak market. Most are of the home-built variet either constructed from a kit using sheets of marine-grade plywood stitched and then glued together from thin cedar strips laid over a form and sheathed in fibreglass and epoxy. These kayaks a frequently of great beauty and often are surprisingly durable, given the right amount of maintenanc They are fun and inexpensive to build, the most common reason for choosing this type of boat over i less easily damaged fibreglass and polyethylene relatives.

Also popular among home builders are lath and canvas models and replica traditional kayak which can be built from plans and locally available materials. Such boats have an internal frame wood with ballistic nylon or 14-ounce canvas stretched over it and then painted or varnished. The li of the fabric is from five to ten years, after which the boat can be stripped to its skeleton, the woo revarnished and a new skin fitted. These kayaks are lightweight, inexpensive and easy to build, thoug not exactly bombproof. A tougher hull can be created with the use of high-tenacity nylon rubberized cloth.

As we have seen, standard folding kayaks consist of a frame and removable skin. Frames a commonly made of wood or aluminum or a combination of both in boats made by Folbot. Ash is th most common wood for longitudinal frame pieces because it is both durable and flexible. Cro frames of birch plywood are used in Kleppers and Nautiraid kayaks. Feathercraft boats feature a fram of high-grade aluminum with a baked epoxy coating and cross ribs of high-density polyethylene. New Zealand company, First Light, has started production of a tubular carbon fibre folding kayak th weighs in at only 9 kilograms (20 pounds).

Wood has the advantage of being relatively easy to repair, though of course there is nothing t prevent you from using wood for temporary repairs to an aluminum or carbon fibre frame in the fiel The disadvantage of wood is that it can absorb water and swell. Aluminum, in contrast, suffers from vulnerability to corrosion and electrolysis—particularly in warmer climates. All folding boats shou be disassembled regularly to prevent them from metamorphosing into rigid ones. Small met assembly parts are present on most frames and will need special care.

Today’s hulls are made from Hypalon, nylon-covered butyl rubber, or specially formulate urethane or a less expensive vinyl composite. Feathercraft is now using Duratek, a ballistic hig tenacity nylon, instead of Hypalon.

Deck fabrics vary widely. Cotton is still used, and though it is somewhat vulnerable to damage b ultraviolet radiation, it breathes, allowing air and moisture to pass through. This characteristic kee the boat pleasantly cool in the tropics, since evaporation occurs off the inside, providing a natural ai conditioning system. Feathercraft is now using Poly-Tech, a polyurethane-coated nylon that can b radio-frequency welded to ensure waterproofness. This material is lighter than cotton, particular when wet. It is also waterproof, rot resistant and shrinkproof.

Hull design

Hull shapes and their significance, I confess, are aspects of boat building that mostly elude m understanding. Why is it that one successful model is fish form (its widest beam forward of th cockpit) while another is Swede form (its widest beam aft of the cockpit) and yet another symmetrical? What are the key features that make them work? Does it really matter? My bas ignorance is not for want of trying to understand. I listen, along with the other kayak users, to th explanations of designers, and I marvel at their plausible reasons for why the hull was rounded just s

why this or that amount of flare was put in the bow to give added lift at speed and, of course, how the
went about ensuring that their boat would not pearl as it surfed off the wave. I marvel at the science
building supposedly turbulence-triggering diamond-shaped ridges into the hull so as to disru
laminar flow and prevent drag! I often find such talk disconcerting because I happen to know that th
designer simply took a design, padded it out with bondo paste, added a foot of length amidship
changed the shape of the stern, adjusted the pitch of the deck, added multiple chines for stiffness, trie
it out to see if it had improved any, then attempted to rationalize the results.

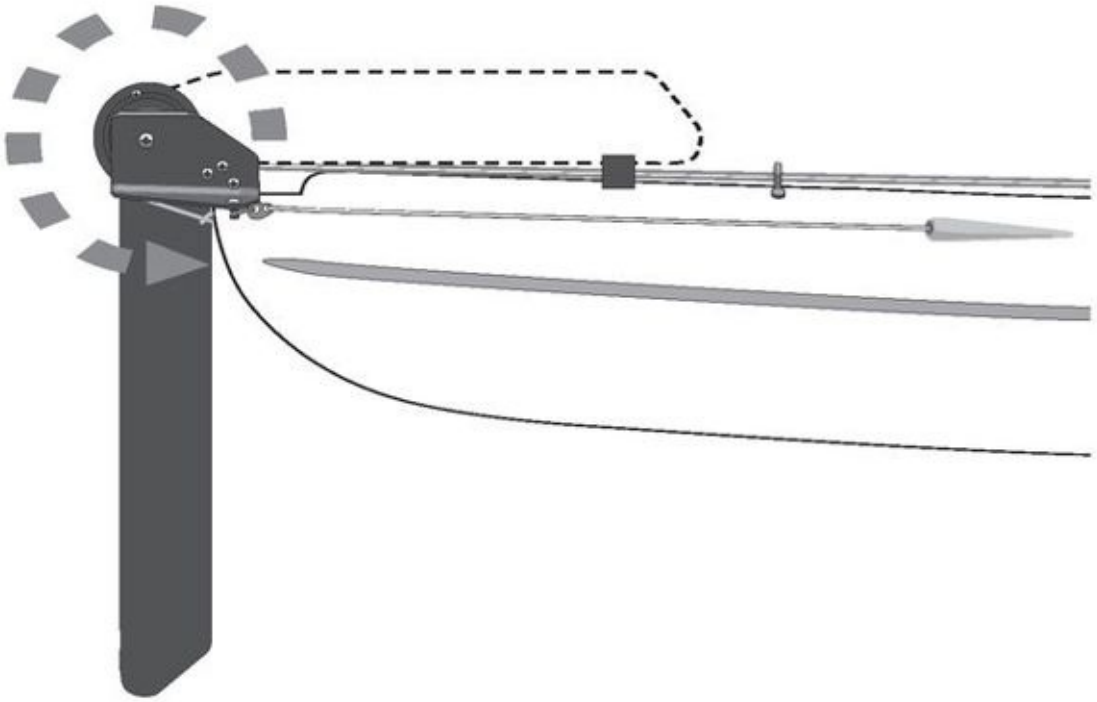
To learn something objective about hull design and answer some of the more basic questions, *Se*
Kayaker magazine once sponsored a series of tests on popular models of touring singles within a give
length and beam range. During the first testing of eleven kayaks, engineer and kayaker John Dawso
supervised the program using the magazine's own facilities and the $2000-a-day test tank at the B.C
Research laboratories in Vancouver. Various tests demonstrated that some boats behave differentl
from others and revealed some startling facts—for example, that raising the height of the seat by 2
centimetres (1 inch) could halve some kayaks' stability. The tests also demonstrated, however, tha
some boats that looked radically different behaved almost identically. Almost nothing could b
confirmed about basic hull design except for the most obvious stuff—such as that long, narrow boa
go slightly faster than short, fat ones—and even these differences were not nearly as great as had bee
expected.

Computers have not yet provided us with the answer, either, since they consider only the wette
surface on calm water and not the effect of construction above the waterline, such as the profile of th
deck. Too often when designers have relied on the computer for their inspiration, a dog was born—
garbage in, garbage out and all that. We seem to be so far from understanding why one hull works an
another does not that I doubt I will see the day when we can accurately project our knowledge
design radical new shapes (or perhaps radically ancient shapes) for boats. Today kayak design still lie
mostly in the realm of craft and living tradition, and perhaps it is better that way; at least it allows f
some imaginative explanations. I also draw some comfort from the embarrassment that must hav
been felt by the designer of *Magic,* a 1983 challenger to the America' s Cup, which, test-tan
researcher Francis Clauser discovered, travelled through the water more efficiently backwards than
did forwards, rudder in place and all. So much for science and boat design.

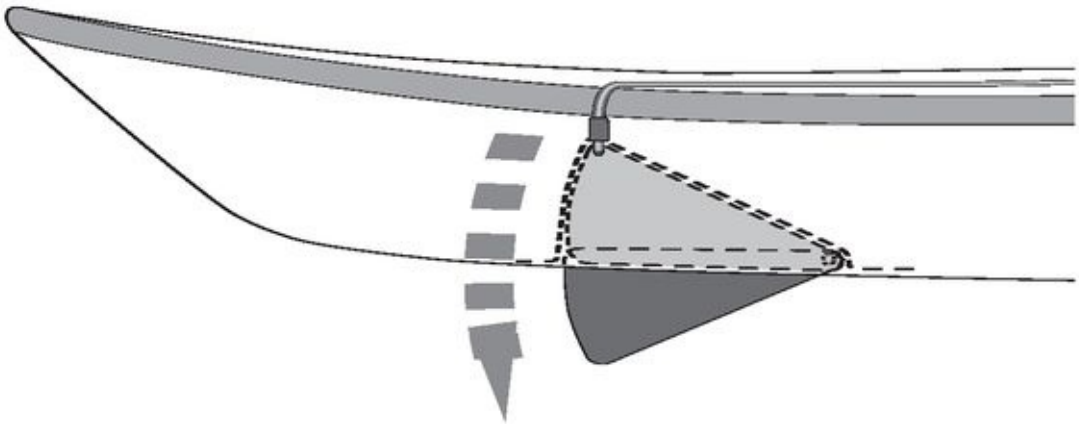
Having made my reservations abundantly clear, let me repeat some of the popular wisdom that ha
gained credibility: long kayaks (up to about 7 metres, or 23 feet) are faster than short ones, given
powerful paddler (if the paddler is not strong, a long boat may actually be slower because of th
greater wetted surface); wide kayaks are more stable and more difficult to lean than narrow one
round-bottomed boats can be leaned more smoothly than flat-bottomed ones. (Despite optimist
rumours to the contrary, narrow boats have not proven themselves to be more seaworthy than wid
ones.) Fish-form hulls are said to be more efficient than Swede-form ones by half the builders, whi
the other half swear it is just the opposite. A deep forefoot makes a boat hard to handle in wind, a
does a high bow. A faintly V-shaped hull provides stiffness and aids with tracking when the V i
carried aft of the cockpit. Rocker helps with turning; the more rocker, the more easily the boat turn
but the harder it is to hold on a straight course. A fine entry cuts the waves cleanly but requires above
the-waterline buoyancy to prevent plunging. The stern should have both volume for buoyancy and
fine exit to minimize friction from turbulence.

RUDDERS AND SKEGS

A rudder, operated by cables running forward to controls at the paddler's feet, saves effort on an sea kayak. It is a necessity on the larger doubles if they are to hold course in cross winds or be turne efficiently. A good rudder allows you to devote your paddle strokes to straightforward propulsion wit an occasional support stroke. For years I paddled a single with no rudder, and I can remember time when, in order to stay on course in a cross wind, I paddled fourteen strokes to port for every one starboard. A rudder alleviates this problem. In singles, however, a rudder should not be considered turning device to replace the ability to manoeuvre with the paddle or to control major broachin problems. It saves effort in maintaining a course in cross winds, and though some additional dra results, the compromise is usually a good one.



A flip-up, manually retractable rudder.



A retractable skeg, controlled from the cockpit.

Kayakers who are proud of their repertoire of paddle strokes are sometimes put off by rudders, as it were demeaning to guide the kayak with the feet, and the problem of insecure footrests can be serious one for some people when rolling. But on a long voyage, or even a short one during adver conditions, this device can save much wear and tear on belly and shoulder muscles. A well-designe rudder, usually of high-grade aluminum or stainless steel, can always be cocked out of the wate where it will be less likely to become damaged and will not impede the ability of the kayak to l turned sharply while being leaned onto its gunwale. The best situation is to have a sea kayak th paddles well without a rudder but that has one anyway.

In doubles, rudder controls can be in either the forward (No. 1) or aft (No. 2) cockpit. The paddl

in the No. 1 cockpit has an unobstructed view of the bow and what lies immediately ahead, where the person in the No. 2 position has a more commanding view of the whole boat and a greater sense control. It is useful to fit auxiliary stirrups to the rudder cables so that they can be operated fro either cockpit.

A rudder takes quite a hammering on a long trip and must be strongly built. It should be cocked f negotiating surf or for lying to a drogue and should kick up automatically on striking a submerge rock. In surf, rudders can be downright dangerous to anyone in the water or to anyone attempting scramble aboard over the afterdeck.

I have to eat most of the disparaging comments I made about skegs in the earliest editions of th book. Since then, I have paddled kayaks with skegs that worked well, and though I have yet to pref them over a good rudder, I am impressed. The skeg amounts to a fixed rudder, which is occasionall adjustable and is usually designed to be lifted out of the water. It shifts the pivot point aft in smooth round-hulled craft such as whitewater boats, and it enhances the tracking ability of mo manoeuvrable yet V'd touring kayak hulls. The ideal placement for the skeg appears to be just aft the seat, located in a boxed slot recessed into the keel-line of the boat. The blade is raised and lowere with a cord leading back to the cockpit; thus, the amount of draught can be adjusted according conditions. A skeg or a retractable dagger board so placed is almost never lifted clear of the water b passing waves, enhancing its effectiveness in rough seas. In addition, placing the new pivot poi closer to the natural (central) pivot point makes the boat much more manageable in wind than it wou be if the skeg were placed at the stern.

BUILT-IN BUOYANCY

Without special buoyancy systems, fibreglass boats will sink as soon as they fill with wate Polymer kayaks will float so low as to be unmanageable. The best buoyancy is usually the mo buoyancy, and every opportunity should be made to maximize and back up buoyancy systems. Th most effective one is a boat full of foam or air in sealed compartments. A number of other provision for built-in buoyancy—including the air sponsons of some folding kayaks, the blocks of foam th some people permanently jam into bow and stern, and the watertight bulkheads, pods and self-drainin cockpits found in various models of rigid kayaks—are more practical because they leave room f gear and legs. The benefits of built-in buoyancy become especially obvious when one considers th number of inexperienced paddlers borrowing or buying used kayaks from individuals who may negle to explain or emphasize the need for adequate buoyancy. Over the past few years, the rash of fatal an near-fatal accidents involving insufficiently buoyant boats that sank or could not be re-entered hav made this message even clearer. The disadvantages of built-in buoyancy are that it can wear, fail o prove insufficient—and this is why it should not be relied on without backup systems of waterpro air-filled gear bags.

Bulkheads and hatches

Watertight bulkheads made from either fibreglass or closed-cell foam caulked into position provid dry stowage and structural support as well as buoyancy. To be effective, bulkheads should be fitted a close to the back of the seat and as close to the end of the footrests as possible; this placement wi