THE SEA TIGER©
HANDBOOK

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THE SEA TIGER - The kayak designed for safety and versatility

The rougher the going, the more impressive the performance,
... and the easier the coming back.

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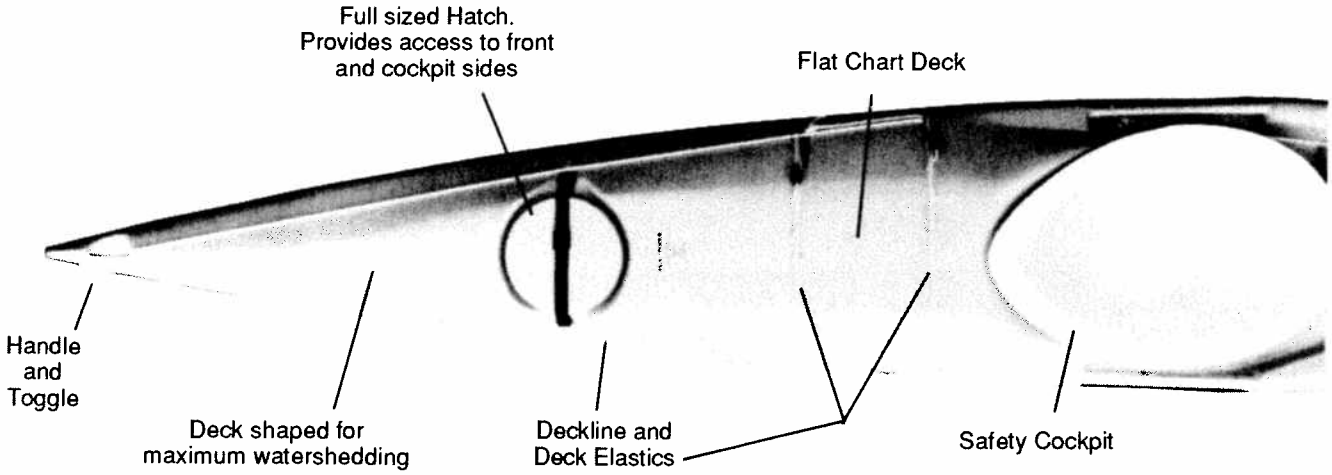
1. INTRODUCTION

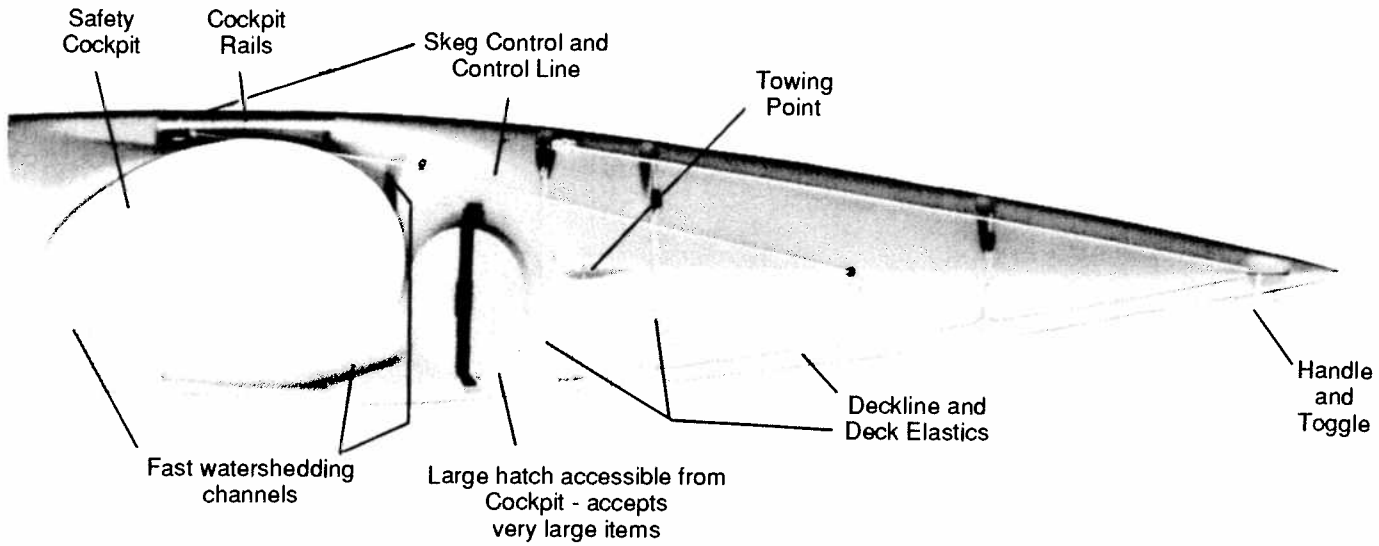
The **SEA TIGER** is a revolutionary kayak in a league of its own. It incorporates design principles and details not to be found elsewhere to the extent that all aspects are fully protected by Copyright. The range of advanced facilities that the kayak provides has to be appreciated. The techniques necessary to obtain full advantage have to be understood by it's users, whether they be novices or fully experienced. As with everything else, the user's knowledge and ability is the other half of the package in order that the designed benefits can be fully exploited. This Handbook gives a full appreciation of the **SEA TIGER**'s proven, and independantly tested, facilities, how to test and use them for oneself, develop one's proficiency and fully appreciate the new experience to be obtained. It is recommended that users develop canoeing expertise along the lines specified within the British Canoe Union Coaching Scheme and that the tests and techniques described herein are regularly practised. It should be noted that some techniques are **not** necessarily applicable to kayaks of other designs.

The kayak provides the facilities.
This Handbook describes how to obtain the advantages.
The wise kayaker learns how to gain the benefits.
Read on - and happy kayaking.

FRONT DECK LAYOUT



REAR DECK LAYOUT



2. GENERAL SPECIFICATION

2.1 Physical Features

- Length - Only 14ft. 9 ins (450cms).
- Weight including all fittings - approx. 65lbs. (29kg).
- Decklines and quick release elastics fitted as standard.
- Integrated Hatches with hatch covers that float.
- Fully adjustable integrated skeg with simple control.
- Beam - 1ft. 11 1/2 ins. (60cms).
- Construction - Matt Glass/Diolen.
- Fully integrated Safety Cockpit.
- Internal Loading Capacity - 250 litres.

2.2 Operational Advantages

The Length, Weight, Hull and Deck Shapes, Deck Rails and Fittings, Adjustable Skeg and Safety Cockpit provide for:-

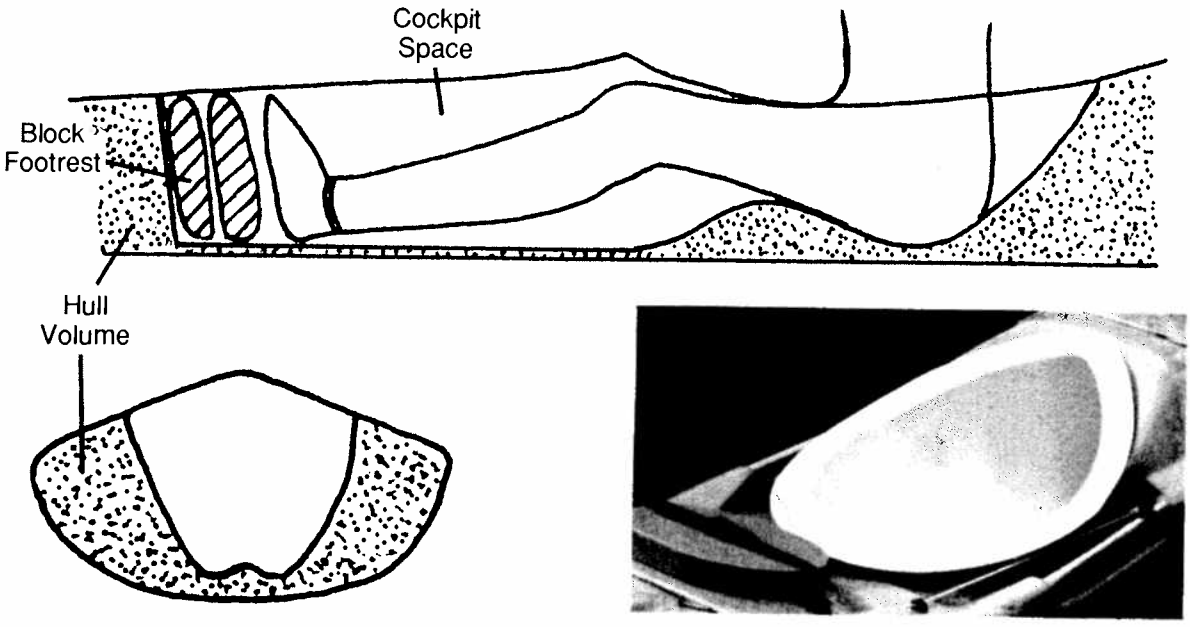
- Stability, even in difficult conditions, either unloaded or loaded with equipment - suitable for day or expedition paddling.
- Ease of control from being very manoeuvrable to being able to tune to just the necessary amount of directional stability to meet the conditions at the time - no more complex, and inefficient rudder systems or one arm paddling.
- Cockpit seat designed for comfort over long periods of time - optional sizes.
- A fast kayak and excellent swell surfer - even on quartering seas.
- Hatch facilities permit very easy loading even of awkward, very large items.
- Easier landings at and departures from difficult locations.
- A kayak easy to control and hold on to after an exit in rough water and surf.
- A dramatic reduction in damage to boats and equipment and in the possibility of personal injury or the effects of long periods of water submersion.
- Simple, very fast assisted rescues (only one assistant required) - no conventional emptying problems
- Very rapid self rescue (in under 20 seconds) even in surf.
- Minimal reduction of stability with water in the cockpit - enables paddling away from danger without wasting time emptying or fitting spraydeck.
- Easy towing upside down or the right way up - even whilst swimming.

3. GENERAL PERFORMANCE

3.1 Cockpit and Seating Position

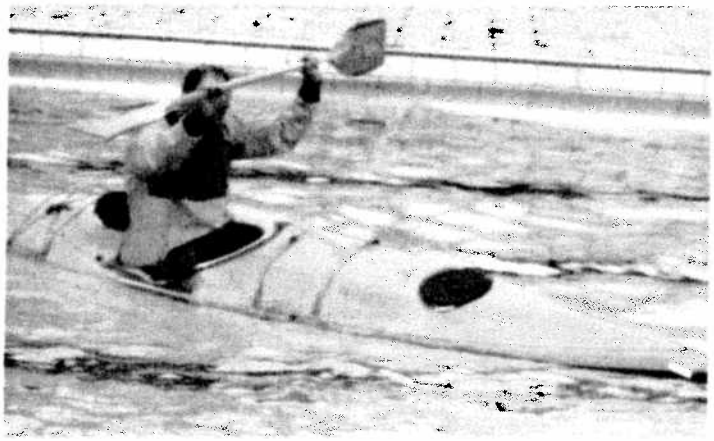
The **SEA TIGER's** cockpit is designed for comfort over long periods of occupation. Ideally the paddler should arrange the angle between the upper leg and back to be such that a comfortable sitting position is established whilst the top of the thigh is supported against the deck. Some may find it necessary to fit thigh supports. The footrest blocks should now be fitted such that the balls of the feet make contact and the heels are together meeting at the inverted V in the bottom of the cockpit. It should be possible to straighten the legs by allowing the heels to touch the footrest and also to lean back on one's elbows to relax. With these adjustments the paddler should feel comfortably locked into position and an integral part of his kayak; he should not be just sitting on the seat bones but also supported by the underside of the top leg giving a greater contact area and a very comfortable sitting position. It will be noticed there is no possibility of feet becoming trapped behind footrest bars or supports. The kayak can be fitted with different cockpit widths.

LAYOUT OF SAFETY COCKPIT AND RAILS

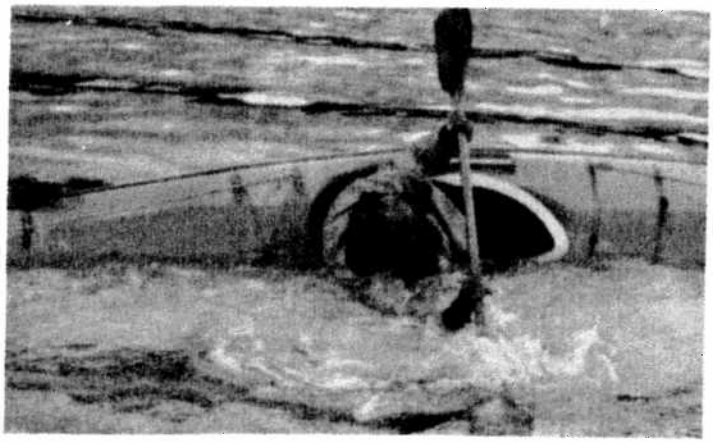


3.2 Some Initial Recommended Tests

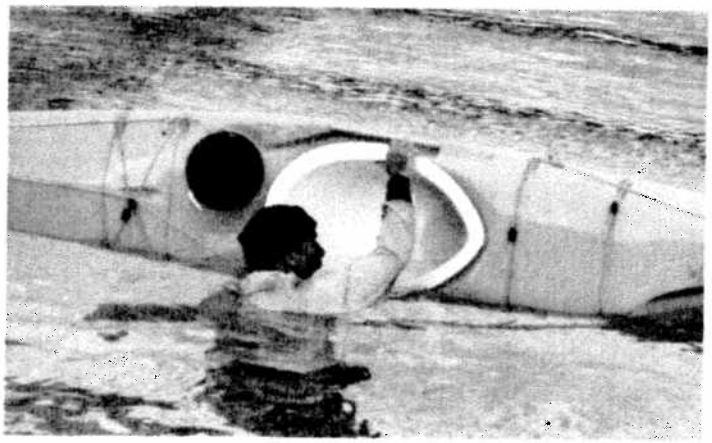
In calm, controlled conditions, start getting the feel of the kayak. Test the stability by holding the paddle at chest height and flicking the kayak from side to side with quick hip movements. Paddle forward and in reverse. Try turning the kayak with sweep strokes with the skeg up, noting the ease of turning, and then test the remarkable difference with the skeg down. Try rolling the kayak with a spraydeck fitted (if you can roll, of course). Then try rolling it without a spraydeck. Note the quantity of water in the cockpit and retest the stability as before. The roll without a spraydeck will require slightly more effort. Then try paddling forward and in reverse. Try the full range of support strokes, draw strokes, turning strokes etc., whilst in this condition. If rolling is not a possibility then add water to the cockpit a bit at a time and go through the routine of testing stability etc. Completely fill the cockpit with water and try support strokes.



Testing the Sea Tiger stability with water in the cockpit by hip-flicking. Note excellent kayak trim.



Skulling for support without spraydeck fitted.



Turning the kayak upright from in the water. Note the small amount of water in the cockpit.

It is very important to understand how the kayak behaves when the paddler is trying to control it from in the water. This knowledge is essential during rescues. Firstly, roll the kayak over and make an exit. Then, using the cockpit rails, see how easy the kayak is to control. Turn it over from in the water by reaching either under or over the boat. Note how much water there is in it when this has been done. Then fill the cockpit with water and check the stability. then upturn the kayak and turn it back up and note how it has emptied. Then note that, unlike any kayak with upturned ends, but similar to a general purpose kayak, it is very stable upside down or the right way up, both when empty and full of equipment even when the cockpit is full of water. (This is most important when considering self rescues with a loaded kayak).

Make yourself a safety harness which comprises a loop to pass over one shoulder and under the opposite armpit and of such a size that it can be quickly removed and yet will not get in the way. Then have a short line from it terminated at the far end by a large spring loaded carabiner. The length of this line should be such that it hangs in a slight catenary when it is attached to the front deckline and allows the paddler to lean back in the cockpit. When in use it should be clipped to the deckline on the preferred side for rolling. Care should be taken to ensure that there is no obstruction to prevent the carabiner sliding the full length of the deckline from the cockpit end to the bow. The use of this harness is discussed more fully in the rescue sections. It is described here to enable the paddler to start to appreciate it's use when he is in the water. Clip the safety harness to the front deckline as described and swim towing the kayak both the right way up and upside down. Also, facing the bow of the kayak gently pull it towards you and push it away. Note the ease with which the **SEA TIGER** moves both upside down and the right way up in these tests, even when loaded.

The photographs demonstrating the tests and rescues have deliberately been taken in swimming pool conditions to convey the necessary details. It is recommended that all tests should be conducted at sea after initial experiments in controlled conditions. Our thanks to Atlantic College, South Glamorgan for the use of their outdoor pool facility.

Correct wearing of Safety Harness

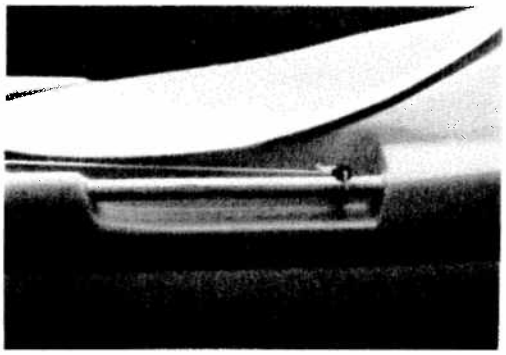
Swimmer towing inverted kayak using the harness.

The principles learned in these simple experiments form the basis of the rescue techniques and will begin to establish the important and very considerable advantages which are to be obtained with the **SEA TIGER.** It is essential to appreciate these aspects of the design performance and how to use them to best advantage. When some of the rescues have been tried these experiments should be repeated in more difficult water, whilst still in controlled conditions. As confidence is built with the rescues the advantages will become more apparent and automatically the conditions of testing will become more severe.

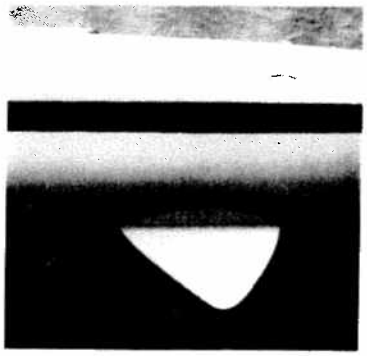
3.3 The Adjustable Skeg and it's uses

It is not possible to design a small craft to satisfactorily meet most conditions at sea without changing the profile of the craft as presented to the elements or, alternatively, fitting a forcing tool such as a rudder. On kayaks, rudders are now often seen. They have the advantage of overcoming the problem of one arm paddling frequently made necessary to maintain a required course in difficult conditions, which can be mentally and physically very tiring. Rudders suffer several disadvantages including a breaking effect, unwanted sideways drift, control complexity and the wasteful use of the paddlers energy to name but some.

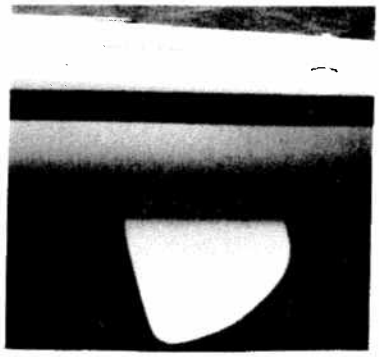
The alternative approach is to change the profile of the kayak as presented to the elements and to be able to vary this profile, at will, to meet the conditions at the time. Such a design is the variable skeg which has two prerequisites for it to work satisfactorily. The kayak **must be basically manoeuvrable** and the size and position of the skeg **must be integrated** most carefully with the overall exterior design of the kayak. In this way the advantages of a rudder are obtained without any of the disadvantages since all the corrective effort is provided by the elements. For the **SEA TIGER** the results have been variously described as "out of this world", "remarkable" and "uncanny" by many.



Simple Skeg control



Skeg partially deployed



Skeg fully deployed.

It is not necessary for the skeg to be used for the very large majority of the time. If the skeg is down and is rattling in its box then that is a sure indication that it is not required and should be either partially or completely withdrawn. Probably the best way to learn how to use this facility is to consider this example. If one is trying to maintain a particular course and, in the conditions at the time, the kayak has a tendency to turn to port when the skeg is up then fully drop the skeg and almost invariably the kayak will tend to turn to starboard (or vice-versa). Somewhere in between will be found a position to maintain the required course. This may seem a bit unpredictable when described in this way but very little practise is required to immediately position it for a given set of circumstances and speed of travel.

Having established the setting it will remain thus. Even when passing over an underwater obstruction the skeg will be pushed up and fall back to its preset position. It may be noticed that, as the variable water and wind forces affect the kayak, it may wander a few degrees off course in a sort of corkscrew action either side of the mean course, but just keep paddling normally for it will automatically correct itself. For large deflections caused by larger than average forces, the situation will still rectify itself by paddling normally. Simple experimentation will clearly demonstrate the advantages.

The **SEA TIGER** is an excellent swell surfer and, making use of the skeg, the problems of broaching and then having to return to course are much reduced. If broaching does occur lift the skeg and make use of the manoeuvrability to simply restore the situation. It is difficult to advise on precise skeg settings for the best result to enable one to surf both in front of and at an angle to the wave. The best suggestion is to play, starting with the skeg in the half way position. One thing which may be found is that with a "big gun" ride the bow dips below the water and the deck sheds water - then just lean back and go man go. The reason for this is purely the speed at which one is travelling with the skeg doing its work of holding the course, from behind the paddler, whilst the absence of a long directional keel to the front limits the broaching pivot. When surfing on broken surf the general recommendation is to withdraw the skeg since the boat will tend to trip over it in the event of a broach. In this situation, if one broaches and has braced over the wave, then hold on. As the power of the surf decreases, gradually bring the brace to the stern and the bow will come round to make a bow first landing.

Another use of the skeg is when towing. Some prefer to tow using a line with a quick release harness around the waist. Others like to use the tow point provided on the kayak. Whichever is selected the **SEA TIGER** has the advantage that it does not have a raised stern or a rear mounted rudder and controls which can snag the towing line. If there is a tendency for the towed kayak to wander excessively then the line can be passed through the stern handle, but not the toggle line. Dropping the skeg will then provide a very good tow. It is important to check that the harness used will pass through the handle to enable quick release, should this be needed.

In addition to not inducing breaking or sideways drift it will be noticed that the skeg is situated well under the keel. This ensures that, when deployed, it will always be operable and will provide a continuous correction. It is also very simple to remove from its box, is simple to operate with only a single line and requires no maintenance other than to ensure that the operating line is in good order. The knack of using the skeg is not to play with it, but adjust it as little as possible. Adjustment only takes one or two seconds.

3.4 Kayak Speed

A kayak's speed is often stated as being faster for kayaks for longer waterline length. The theory is more applicable for flat water because the full length is being utilised virtually all the time in these situations. On the sea any such advantage is reduced as even normal sea conditions develop. The movement of the kayak over the undulating water becomes very important and the effective length, combined with the effective hull and deck shapes, is of more significance. Any difficulties in directional control, time lost in having to employ support strokes for reasons of instability, the effects of sideways drift and overcoming braking caused by rudder, the effects of sideways drift and time lost with one arm paddling, or recovering from broaching all reduce speed. On the other hand, the reduction of these problems and added good swell surfing characteristics considerably increase speed. The care taken with the design of the **SEA TIGER** in these respects has resulted in an ease of control and a speed which is both unexpected and surprising, as experienced users testify.

3.5 Kayak Loading

Loading a kayak is also an important factor in order that good trim and, hence, performance are maintained. For the **SEA TIGER** it is recommended that light, buoyant items such as sleeping bags and carry mats should be stored in the stern. The very large volume around the back of the cockpit is best used for holding heavy items with long pieces, such as tent poles being carried alongside the cockpit liner. Medium weight items are best stored in the bow section. The sealed volume of the **SEA TIGER** is huge, 250 litres. Full sized BDH's can be stored in both the front and rear sections and the slope of the rear hatch allows for very long items to be easily loaded. For a partly loaded **SEA TIGER** do not put all the load in one end but distribute it between the bow and stern sections to maintain good trim and extra buoyancy distribution.

Following tests carried out by The British Canoe Union a recommendation was made that any normally sealed volume of any sea kayak remaining after loading equipment should be filled with air buoyancy. This is for safety reasons in the event of flooding caused by a leak. The **SEA TIGER** has its own design system to minimise the effects of this problem (see Rescue Section) although, for belt and braces protection this advice is sound. However, due to the design concept it is recommended for the **SEA TIGER** that only about four fifths of the volume remaining should be so filled. Also, **never** put additional buoyancy into one end only for this will give the same disadvantages as presented by a bulkhead.

4. RESCUES

4.1 Introduction

The Design Philosophy and Results Section emphasises that stability and ease of control are the most important factors in maximising safety, and gives the reasons why. The other fundamentally important factor is that if either or both of these essentials are temporarily lost, for whatever reason, they should be capable of being very rapidly and easily restored. The **SEA TIGER** is designed to do this without the need for pumping, having to lift large weights of entrapped water, fitting spare paddles into shafts in the boat etc. All these techniques are considered as being time consuming, difficult to use effectively in the type of conditions where incidents occur and have to be deployed when stability is in jeopardy. The fact that they are considered at all emphasises the difficulties and instability normally met in rescue situations. Eliminating the need for them has been a major element of the **SEA TIGER** design.

Virtually all incidents occur as a result of a temporary loss of concentration or the inability of the paddler, through lack of experience and/or expertise, to handle the conditions in which he finds himself and his kayak as a combined unit. When such situations occur they usually result in a capsize and an exit, if rolling is not possible or is unsuccessful. Problems can then escalate very rapidly, particularly in rough conditions.

Water is extremely heavy - a cubic metre weighs exactly a tonne. It goes without saying that if the cockpit is designed to take the minimum amount of water, the more buoyant the rest of the kayak remains and the simpler will be the rescue. If, in addition to that, the cockpit empties in the manner described earlier the benefits become very dramatic.

Very rarely, if a kayak is properly maintained and does not leak, will rescues be required as a result of water getting into otherwise sealed sections. However, if this situation does arise, it can be very serious and the kayak's design must essentially take full account of it. Every attempt should be made to enable simple and easy rescue. The **SEA TIGER** design has paid attention to this requirement.

Having achieved these design advantages, how can the kayaker obtain maximum benefit? Rescues applicable to the **SEA TIGER** will be described as assisted rescues and self rescues and then the problem of water entering the normally sealed volume will be considered under the heading of flooded rescues. It should be noted that the rescues described are **not** applicable to other designs. Since one could be in a position to have to rescue others not fortunate enough to have the **SEA TIGER** advantages it is wise to also be aware of the rescue techniques for other craft in similar situations.

Important Note: Reference is made in the rescue descriptions to being able to release the kayak relying on the safety harness. In real rescue situations, as distinct from testing in controlled conditions, one should always try to maintain direct contact with your kayak. In these circumstances the safety harness should be considered as an additional safeguard or as an aid to ease problems. **Always ensure decklines are in good condition and secure.**

4.2 Assisted Rescues

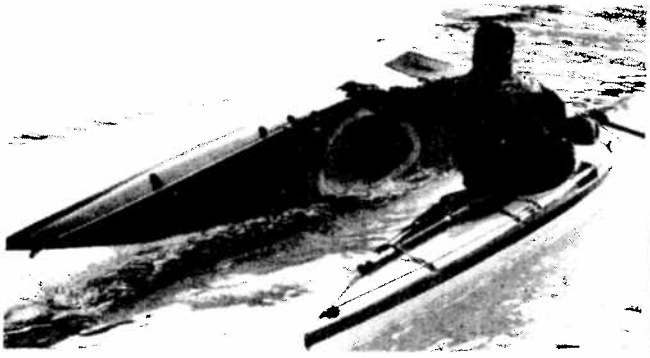
Following a capsize and exit there is never any necessity when rescuing a **SEA TIGER** for the kayak to be dragged across the assisting kayak in an X rescue format. All that is required is for the **SEA TIGER** to be turned over. Virtually all the water will be emptied out by this action. Any that remains can easily be removed by the rescuer by taking hold of the front decklines, tipping the **SEA TIGER** on its side whilst leaning away from it. This will raise the bow slightly and finish the emptying process. Because there is no need to get the two kayaks involved at right angles to one another a major advantage results. If the **SEA TIGER** is turned so that the bow faces the elements and the rescuing kayak comes alongside there is no chance of one kayak tripping over the other in difficult conditions as in the case for a conventional X rescue. This reduces the possibility of damage and the most stable rescue situation of a raft facing into the elements is established.

Turning the **SEA TIGER** to face the elements is simplicity itself. Once the paddler is in the water (call him the victim for convenience) he immediately becomes a sea anchor. If he holds the front toggle the stable and buoyant kayak, irrespective of which way up it is, will turn to face in the required direction. It is an excellent practise **with this kayak** to commence all rescues in this way (except for hull flooded rescues).

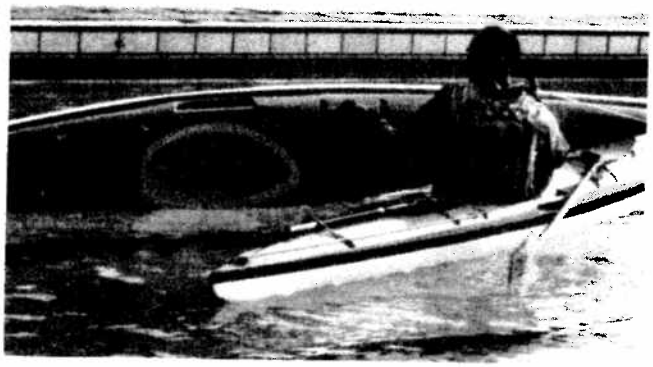
Having emptied the kayak the paddler is reinstated in the normal manner. What happens next depends upon the situation and the conditions. If it is possible, put on the spraydeck immediately. If, on the other hand, the party is being driven onto rocks then paddle out to sea immediately **facing the elements** (one should already be facing that direction) in order to provide sea room to safely complete the rescue. If water has entered the cockpit, whilst paddling to safety, then the cockpit can be emptied again with the paddler in situ by coming alongside an assistant whilst still facing the elements. The victim will lean across the assistant's boat, tilting his own boat as he does so, the assistant will hold the front decklines as described above slightly lifting the bow. Replace the spraydeck and go. Alternatively, use a sponge to remove the water or some may possibly like to have a small hand pump. When in a heavy sea, this final emptying operation may be necessary if a large quantity of water has entered the cockpit whilst the victim was being re-instated. Yet again, it may well be unnecessary to do any more than replace the spraydeck in any situation other than major cockpit flooding due to the stability of the kayak with water in the cockpit. Try this rescue and subsequent actions in controlled situations.

Preparing to right upturned Sea Tiger

Draining water from cockpit.



Righting the kayak - note single handed operation.



Correct position for draining any remaining water from the cockpit.

4.2 Assisted Rescues *continued*

As an extension to this series of tests fit the safety harness, as described above, and secure the paddle with a paddle leash to the wrist on the preferred side for rolling. In controlled conditions remove the spraydeck, roll over, exit and let go of everything. The **SEA TIGER** will go to leeward of the victim, who has become a sea anchor. The carabiner will slide down the deckline to the bow and the kayak will automatically take up the correct position for the rescue. Whilst assistants are coming to your aid pull the stable and unwaterlogged kayak towards you keeping your head on the same side of the kayak as the safety harness carabiner. When assistance has arrived release the carabiner and rescue as before. Rescues have been accomplished, with victims paddling away from the scene, **in just 15 seconds** from the arrival of an assistant. Not bad for a loaded sea kayak! As experience and confidence is increased, all these techniques should be tried in more difficult conditions.

4.3 Self Rescues

Self rescue requires the ability to roll. Firstly, in calm conditions, make sure that rolling the **SEA TIGER** without a spraydeck is easily achieved. When happy that this is so, overturn the kayak and exit. Then, facing the stern, with the head on the preferred side of rolling hold the paddle with one hand firmly against the cockpit rail on the same side. Pass the other hand under the kayak to hold the rail on the opposite side. This is the starting position for the self rescue. Next, take a comfortable breath, duck under the kayak and make the top of the head touch the upturned deck immediately in front of the cockpit. Then, and only then, do a half backward sommersault into the cockpit and lock into the cockpit. Then, and only then, take up the rolling position and roll up. It may sound difficult, but after a few attempts a few seconds is all that will be required to accomplish it. For the first few times it might be an idea to try it without a buoyancy aid until one is accustomed with the process.

Now fit the safety harness and paddle leash as described and push the kayak away so that it faces you bow on. Pull the kayak towards you and take up the start position for the rescue, ensuring that the safety harness and paddle leash are not crossed. Re-enter the cockpit and lock in. As you take up the position to roll ensure that the arm which crosses the boat goes over the safety harness line. This is best done by taking the arm across in an arc above (or rather below since one is upside down) the head. Then roll up. When happy try the rescue in more difficult conditions, steadily increasing the degree of difficulty.

Next, really put the kayak (and yourself) through its paces **but do it steady step by steady step**. Find a sandy surf beach and don a helmet on a day when the surf is within your experience. There is no finer place to test one's proficiency although it is not often used by sea kayakers for practise purposes due to the eternal emptying problem and having to handle potentially large weights of water. With the **SEA TIGER** it can become great fun. Paddle out until the water depth is about three to four feet. Turn round and remove the spraydeck. The cockpit will probably fill very rapidly and there is every chance that the force of the water hitting the

THE "RE-ENTRY AND ROLL" SELF RESCUE

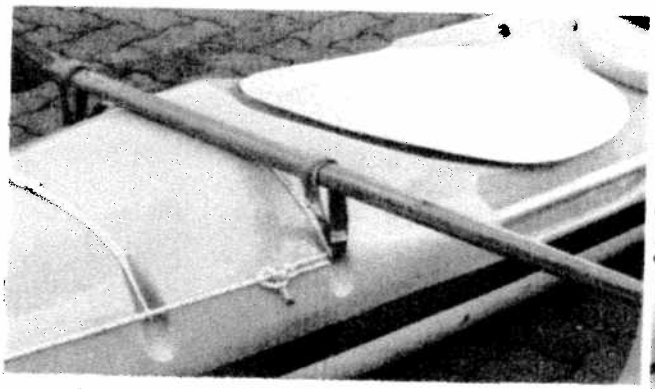
The correct start position for the self rescue, facing the stern then .....

..... a half backward somersault into the cockpit, lock in, then take up rolling position .....

end of it will cause you and the kayak to part company. Please ensure no one else can get in the way. If the cockpit just fills then it will be immediately noticed that the bow will tend to torpedo as the waves pick up the stern. This example emphasises a golden rule - **never turn your back on the elements if the spraydeck is not fitted particularly in broken water**. Whilst the **SEA TIGER** can be paddled without a spraydeck it is recommended for safety and personal comfort that this facility is used primarily in situations where speed in getting out of difficulty is the governing factor.

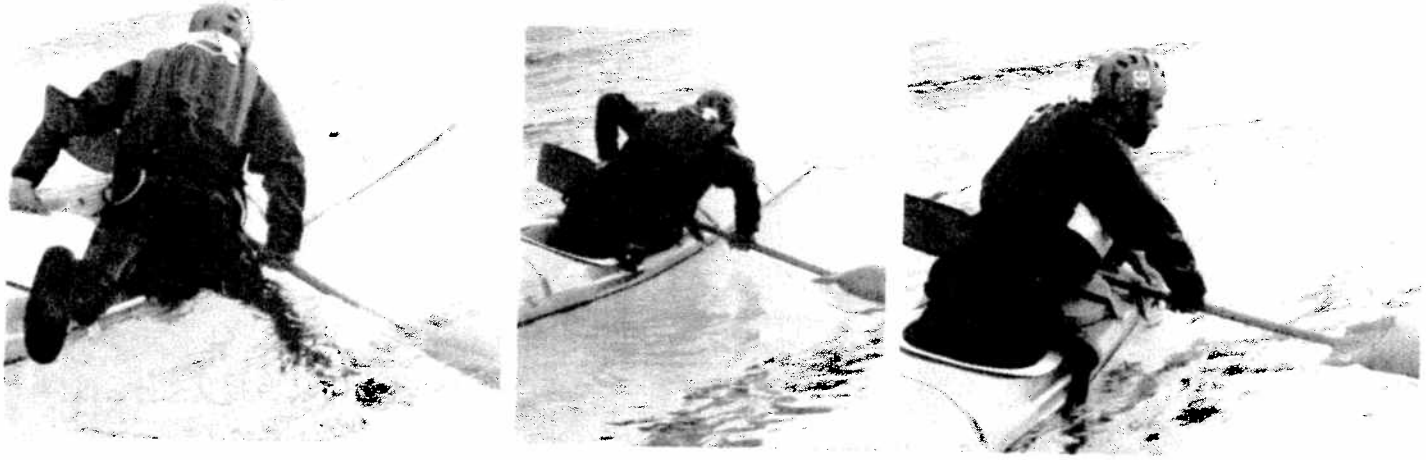
..... and roll up without fitting spraydeck.

THE PADDLE FLOAT RESCUE



Method of securing paddle fitted with float.

Forward Entry Method.



Reverse Entry Method.

Now without a spraydeck, fit the safety harness and paddle leash and paddle out the same distance. Turn over, exit, let go of everything and face the beach. The paddler will almost immediately find that he is to seaward with the kayak pointing bow towards him - the perfect rescue position. As the waves hit both himself and the buoyant unwaterlogged boat he will be pulled very rapidly shorewards with the strain being taken by the harness across his back. Again, the unwaterlogged kayak is using the elements to get him out of trouble quickly.

When happy that it all works paddle out the same distance kitted out as above, roll over and exit. As soon as a wave has passed pull the kayak towards you and take up the self rescue start position as previously described. Wait until the next wave has passed, duck under, re-enter the cockpit and lock in. After the next wave take up the rolling position, roll up and immediately commence paddling out to sea. Once passed the break, turn round and start to come in and be ready to overturn and exit, relying upon the safety harness and the kayak to take you safely ashore - unless the desire to achieve another self-rescue is too great! Self rescues in these circumstances have been achieved in under 20 seconds to the point where the victim starts paddling out to sea.

Another form of self rescue to try uses an inflatable paddle float. The stability of the **SEA TIGER** with water in the cockpit adds to the effectiveness of this rescue, although the comments in the first paragraph of 4.1 are pertinent. With the kayak upright secure the paddle with short velcro straps to the front deck as shown in the photographs. Fit an inflatable paddle float to the paddle and climb into the kayak from the supported side to perform the forward entry. The alternative reverse entry is to secure the paddle in the same way just behind the rear hatch. Climb in as shown then turn over to sit in the cockpit (Ref. 1). Any unwanted water can then be removed, the spraydeck fitted and the paddle easily released. Unlike the re-entry and roll more time is required and it should be remembered that the facility to paddle away is not there until the paddle is released and the float removed. (For kayaks built prior to 1991 please contact the manufacturer).

4.4 Flooded Rescues

The subject of hull flooding due to a leak is one which receives far too little attention. Although it occurs rarely it can result in very serious problems for kayaks with both confluent hulls, as the **SEA TIGER**, and sectionalised hulls where bulkheads are fitted. The effects are different for each type but no less serious. A kayak cannot be considered seaworthy if it has a leak from some form of damage, however small and insignificant it may appear. Any such leak should be found and repaired prior to setting out. Another way in which a leak could arise is by the accidental incorrect fitting of a hatch cover or hatch fittings which have been worn or damaged. **Take care when fitting hatch covers**. Assuming these precautions are taken the chances of internal flooding should be absolutely minimal. If, for any reason, a leak does occur during a trip the **SEA TIGER** design minimises the problems and permits easy rescue.

If a leak occurs, it might appear that a kayak with a confluent interior would be more subject to problems than one fitted with dividing bulkheads. This is not so provided the kayak is well designed with a full appreciation of the concept and all it involves. The potential disadvantages can be converted into positive advantages as has been proven with the **SEA TIGER** thereby making it much more flooding tolerant. Independant, controlled tests of comparison between some conventionally fitted kayaks and a **SEA TIGER** (which behaves as described below) have been carried out which demonstrate the relative effects perfectly as flooding progresses (Ref. 2). This is extremely difficult to describe and without doubt the best way to appreciate what is involved is to try it and the rescues.

Experience and tests have shown that for a **SEA TIGER** the need for a rescue will be less than for conventionally fitted kayaks due to its far greater tolerence to flooding. For example, it can accept far more water into it's hull volume before the performance is seriously affected even to the extent that it's performance is almost unaffected at levels where others are near or beyond their point of criticality. The effect of a leak in a **SEA TIGER** is that any water that enters the hull can travel anywhere within the hull. Its design is such that, at all times when the kayak is reasonably paddleable, it will remain in trim and it is dynamically stabilised to retain a high degree of stability. Eventually, as for any other kayak, it will either lose directional control or will become too heavy to reasonably paddle whilst making progress. Which happens first, and at precisely what stage of flooding, will depend upon the conditions at the time and/or the experience and proficiency of the paddler. What is interesting is that, from a stability viewpoint, the paddler will be almost unaware of any problem developing although the fore and aft movement of the kayak will start to indicate something is untoward.

In tests where attempts have been made to simulate real situations, and in two incidents where flooding due to considerable leaks in difficult circumstances have occurred, at no time has more than about a third to a half of the hull volume been flooded. This is due to certain aspects of the design. Although there is a considerable volume and weight of water to be removed the rescue is simple since the kayak is designed to do most of the work. It should be noted that in this state rolling is virtually impossible and an assisted rescue is necessary.

Ref. 1. This method is a slight development of the method suggested by the manufacturers of the paddle float - Sea Trek, Sausalito, CA, USA.

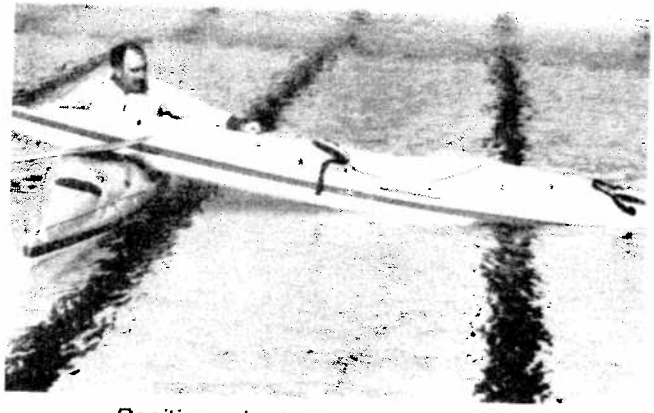
Ref. 2. Experimental Progressive Flooding of two Sea Kayaks - Lamont, September 1989.
Sea Tiger Trials (Scottish Canoe Association for British Canoe Union) June 1990.

THE SEA TIGER "HATCHES OFF" RESCUE

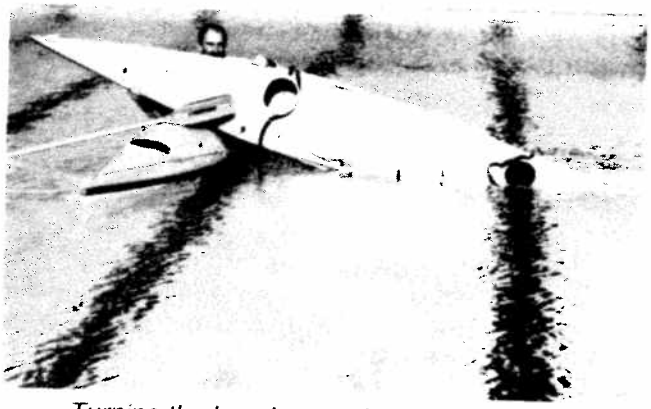
This kayak had approximately 160 litres (350 lbs) water in the hull volume prior to the rescue. Note the trim of the **SEA TIGER.**

Remove hatch covers

Correct position prior to the initial lift



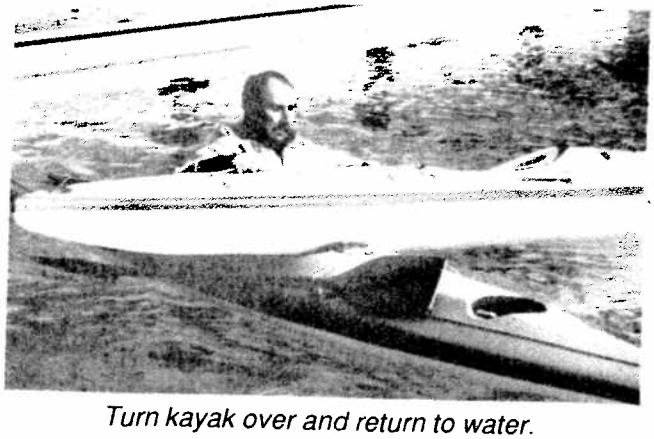
Position prior to overturning kayak.



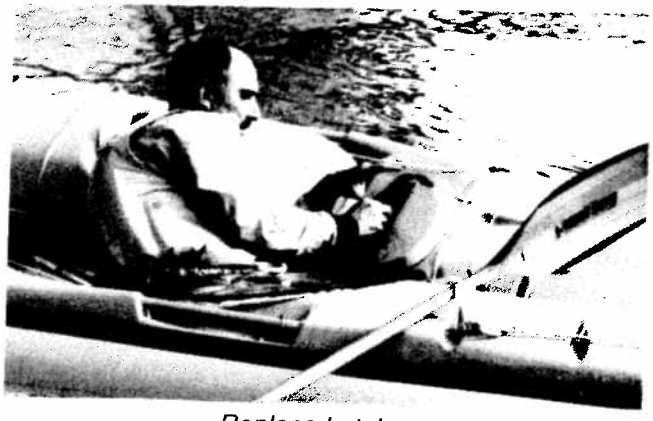
Turning the kayak - rear hatch uppermost.

Slowly bringing kayak across rescuing craft.

Emptying the last water from the hull.



Turn kayak over and return to water.



Replace hatches.

4.4 Flooded Rescues *continued*

To provide an appreciation of the time required for the **SEA TIGER** to fill from a considerable leak and, hence, put this problem into perspective the results of a simple test were as follows. A hole of 10mm ($^3/_8$in.) was drilled into a **SEA TIGER** just behind the cockpit in the bottom of the hull. The worst situation was taken of no equipment in the kayak, so that the water had free flow around the hull whilst the maximum amount of water could enter, and with neither hatch cover being fitted. With a 13 stone (182 lb. or 83 kg.) paddler installed a jet of water some 5 cms. in height demonstrated the amount of water entering the kayak initially. It took 15 minutes for the kayak to become about a third full, hip flicking the kayak was performed without any instability being demonstrated, the trim was excellent and, such are the buoyancy arrangements in the design, the rate of ingress of water had been dramatically reduced. It was not until after 20 minutes that, when sitting still, slight instability was noticed. However, as soon as motion was introduced, by either hip flicking or paddling, stability was restored thereby demonstrating the dynamic stabilisation effect. If the hatch covers are fitted limited back pressure builds up and the rate of ingress of water is much less.

In flat water conditions fill the kayak to about a third full of water and replace the hatches. Sit in the cockpit without a spraydeck. It may be noticed that the kayak is slightly less stable than normal when stationary, dependant upon exactly how much water has been used. Test the stability and start paddling forward, perform an emergency stop, reverse paddle and then return to forward paddling. The effect of the dynamic stabilisation will be demonstrated whilst, at the same time, a slight dipping of the bow and stern will be noticed only whilst changing direction. Now turn over and exit. Notice again the stability of the kayak whilst upturned. Turn it over from within the water, again notice the ease with which this can be done and the kayak's stability.

Unlike a conventionally fitted bulkhead kayak the hull volume of the **SEA TIGER** has two access holes, with immediate advantage to rescue. With the kayak the right way up remove both hatch covers **(which should be tied to the kayak to prevent loss in the manner when supplied new)**. The rescuer approaches the victim's kayak at right angles at the stern and pulls the stern over his boat by about a foot to eighteen inches at the same time as rotating it with the rear hatch uppermost. Immediately all the contained water drains to the bow leaving him with the light end and the sea supporting the contained water via the inbuilt bow buoyancy. Continue turning the kayak over until it is upside down. Air enters the stern hatch whilst the buoyancy lifts the bow and water automatically pours out of the front hatch. Do not hurry - **just let the kayak do all the work for you**. To complete the rescue pull the victim's kayak just half way across the rescuer's boat to finally empty the hull and get any remaining contained water from the cockpit simultaneously. Slight assistance from the victim could be advantageous at this stage to either pull down the stern or push up the bow from the water although it is possible for the rescuer to do this alone. Turn the boat over, replace the hatch covers and re-enter. Note that **at no stage does any significant weight of water have to be taken by the rescuer**. Note also that floating hatch covers are fitted to post 1990 models.

In a real situation, it will be necessary to repair the hole if the leak is significant. After replacing the hatch covers, turn the **SEA TIGER** into its stable inverted position with the sea taking the weight and the inverted kayak acting as a raft, perform the repair, then do a simple assisted rescue on an unwaterlogged boat.

Next go into undulating water and establish the effect of the dynamic stabilisation both with and without paddling and practise the rescue whilst taking care not to extend to serious conditions before being fully conversant and proficient.

The possibility of total flooding in a real situation is almost beyond comprehension. Time is required to fill such a volume during which evasive action to prevent it would have been taken. It will be noticed that if the kayak is fully flooded it still remains almost horizontal (although it would be at an angle of about 30 degrees stern down if someone tried to sit in it). In this case the initial lift of the kayak is difficult. The best technique is for the rescuer to come alongside the fully waterlogged boat, hold the rear hatch uppermost and lean away from the kayak, then get the victim to push up the stern whilst supporting himself on the rescuer's kayak. Water will rush out of the front hatch and in a few seconds the kayak will be empty enough to carry out the rescue as easily as described above.

If the kayak is carrying equipment then the amount of water that will be shipped will be less as a result of the bulk of the equipment and its associated buoyancy. In most instances, for the **SEA TIGER**, where this problem may occur there should be no need for a rescue to be considered. However, **for any kind of canoe or kayak**, one should be prepared for flooding caused by damage, be fully aware of the effects on performance and have practised the relevant rescues.
Note: The performance changes will be different from one kayak to another dependant upon the individual designs.

5. LOOKING AFTER YOUR KAYAK

The design of the **SEA TIGER** is such that there are minimal moving parts which should need maintenance. Paying attention to a few simple points will enable the owner to obtain long, pleasurable and safe service from the kayak:-

a. Regularly check that the decklines and deck elastics are in good condition, properly secured and taut.
b. Check that the buoyancy blocks in the bow and stern are properly secure.
c. When storing the kayak leave the hatch covers off. This will allow air change and prevent a partial vacuum forming inside the hull.
d. Always repair any damage at the earliest opportunity, particularly in the event of it causing a leak.
e. Always ensure that the kayak is properly secured to a trailer or roof rack. The correct position for support is between a third and a quarter of the way in from each end. Either a cradle or a sorbo rubber type of support, is recommended. Never rely on securing the bow and stern of the kayak to the bumpers to prevent side to side movement of any kayak. This method is only an excuse for not providing adequate support and security where it should be. Also, do not transport the kayak loaded other than for minimal amounts of equipment.

6. DESIGN PHILOSOPHY AND RESULTS From the Designers' Viewpoint

Sea kayaking is for enjoyment and to enjoy something and perform at one's best one must be relaxed. For relaxation in a kayak the two most important features are stability and ease of control in as wide a variety of conditions and situations as possible. If, for any reason, either of these two features are temporarily missing then they should be capable of being restored with maximum speed, minimum effort and, if at all possible, without the use of anything other than the basic kayak and the paddle. Without stability one cannot go anywhere or do anything to help oneself, or others, and without control one cannot dictate where one wishes to go.

When design started on the **SEA TIGER** in 1978 no kayak available then met what its designers considered a satisfactory level of performance. The developments on this design have taken place over many years and involved much fascinating work, during which time new information on kayak design parameters have been learned and proven. Many experienced canoeists have contributed with ideas, comments and criticisms, all of which have been invaluable.

Kayaks are used for both day trips and expeditions. It was considered they should be designed to retain the best possible stability in all conditions both loaded and unloaded whilst in flat calm, difficult seas and wind, with water in the cockpit and/or the normally sealed hull space (which may have been damaged or subject to a leak/badly fitting hatch cover etc). They should not have to rely on being loaded to provide stability in difficult conditions. They should be stable when being used as a platform for rescuing others or at all stages when being rescued, either with assistance or in self rescue instances, even whilst the canoeist is in the water.

It is necessary to have control in all the conditions mentioned above. Control starts with ease of turning, or manoeuvrability, whether this be for the enjoyment of rock hopping and exploring caves etc., for easy movement around the scene of a rescue or for quickly getting one out of a tight spot. Directional control, i.e. the ability to maintain a required direction or heading, is required when paddling in open waters particularly in conditions of beam or stern orientated winds and/or seas. Ideally, such control should be capable of meeting an infinite variety of conditions, should minimise sideways drift and should not use the effort of the paddler to achieve it. The full range of control from maximum available manoeuvrability to optimal directional control should be simple, require the minimum of moving parts and control lines, be subject to a minimal possibility of damage (particularly during rescues) and require minimal maintenance and realignment. The kayak should be capable of good control without the use of this facility. Also, to provide facilities to ease control of the kayak when the paddler is in the water is most important.

Good stability and overall control range will also help to prevent incidents occurring in the first place. Furthermore, they will reduce tiredness and equally, if not more importantly, improve mental stability. In the event of an incident the knowledge that these features will assist very swift rescue, even self rescue, will add to this improved mental state. Interestingly, that knowledge further helps to prevent incidents occuring in a manner that many will have found when rolling has been mastered and confidence has been increased. However, to get to this state **it is fundamental for one to know how to use the facilities provided and to equate them to one's proficiency and experience**.

But what was the background reasoning which, from a safety viewpoint, could lead to a design of a kayak that would eventually provide these facilities and promote this type of approach? It was quite simply the realisation that, from the instant a kayaker stepped into his kayak at the start of a trip to the moment he disembarked, his sole platform for survival was the kayak itself with, of course, the paddle.

A rule is often quoted that, for safety reasons, " less than three there should never be in a canoeing party". However, experience shows that, at sea in particular, circumstances and conditions can and do arise where one is effectively on one's own from a safety viewpoint even though in company. Hence, every attempt must

be made in the design of a kayak to enable the stricken canoeist to perform self rescues or, at the very least, to be completely self contained. This will provide the greatest chance of rescue without having to rely upon equipment build into a companion's kayak when being assisted. For example, an often suggested system is to use a pump from one kayak to pump out a section of another. This procedure is full of problems. What happens if a pump is not available within the party or that they be fitted such that this type of use is not possible? If one is available two kayaks can soon be in trouble in difficult conditions once the assistant has removed his spraydeck to use the facility. In the limit, should a pump be needed at all? It is, after all, only a tool to restore stability until the crisis is over and then to make life more comfortable afterwards. In rough seas using a pump can be very difficult, even with assistance, for reasons of instability as anyone who has experienced such a situation will confirm.

The questions we addressed when designing the **SEA TIGER** were such as these. Should a paddler have to fight for stability when in difficulties and at the time he most needs it? Is it possible for him to be stable in all conditions likely to be met even with water in the cockpit, or any other part of his boat? Can the pump be eliminated? Can rescues be simplified? Can self rescues be a reliable possibility? What has to be done to provide these facilities? Are there any adverse effects? Can they be eliminated? Can the kayak be designed for easier handling by the canoeist when he is in the water? What different techniques have to be developed by the canoeist to make full use of any such new facilities and how can proficiency be built up and ability tested?

The attempt has been made to incorporate as many of these principles as possible and to provide satisfactory answers to these questions whilst meeting all the usual needs of a sea kayaker. This has resulted in the **SEA TIGER** which is a totally integrated design, based on highly specialised and copyrighted concepts, and where every contour has a purpose. The hull shape, deck shape, the skeg size and position are all carefully designed to provide the overall performance. The cockpit is designed for comfort and safety and, in conjunction with other facilities (such as the side rails), to enable assisted and self rescue to be simply acheived. The internal hull space is designed for ease of loading, and the easy distribution of loads to maintain trim. More importantly, the shapes and facilities of the internal hull volume are designed to maintain trim and provide a dynamic stabilising effect to the kayak in the rare event of water leaking into the hull space when the kayak is either loaded or unloaded. Many have experienced these new facilities to their great satisfaction. The **SEA TIGER** has been both officially and independantly tested to an extent probably greater than any other kayak has been tested and found good. It's facilities are there for all to try for themselves.

7. WHAT OTHERS SAY ABOUT THE SEA TIGER

There is nothing like making a judgement for one's self when selecting a sea kayak. However, here are some of many unsolicited written comments from those who have critically tested and used the **SEA TIGER** which demonstrate typical opinions of a range of the previously described facilities.

a. M.C. 8/32/90. My husband and I have been keen sea canoeists for thirteen years and spend most summers living out of our canoes, more often than not in remote areas abroad. Consequently we have sought to find a canoe which was safe and comfortable. We first heard of the **SEA TIGER** by word of mouth. A friend of ours was rescued on a Bristol Channel crossing by someone paddling a **SEA TIGER**. The other canoeists paddling "conventional" sea kayaks were all experiencing difficulty in the high wind. He was towed to safety by the paddler in this "marvellous canoe" (his words!). We decided to investigate further, ... We are both convinced that in the **SEA TIGER** we have found the best in the market today.

b. T.C. 22/9/87. For me the **SEA TIGER** has done wonders for my confidence at sea in a kayak and has removed some anxieties which presented themselves while handling (trying to handle) other boats in certain conditions .... I find it all the things it claims to be ...

c. T.S. 1/9/85. Today we had strong Northerlies gusting to gale force. Two of us took the **SEA TIGER** and *another kayak* out in the Voe for comparison. We think so far the **SEA TIGER** is everything you claim for it. Much better inherent stability, and the way it keeps its course when the skeg is correctly tuned is uncanny. Turning back into the wind, while the *other kayak* had a real struggle, the **SEA TIGER** just pulled up her skeg and turned like a slalom boat. We're very impressed.

d. D.R. 22/9/89. I have already had some good times in the **SEA TIGER**. The boat gives a welcome feeling of security and stability. The skeg is great in cross winds and allows a course to be held easily with normal paddling on both sides.

e. R.P. 20/6/86. In the dart to Teign charity paddle I paddled in the company of *other kayaks,* about 20 in all. Although it is not a race people tend to go as fast as they comfortably can (or not so comfortably). I finished alongside the leader having had a bit of fun on the way and feeling fresh and comfortable and having thoroughly enjoyed my paddle - the only regret being that it could have been rougher! I find that I fit into the boat in a way that I haven't found in any other sea kayak, yet I can stretch and lie back on the deck too - Grade A for comfort. Any lingering doubts that I might not have been able to hold my own with "proper" sea kayaks(!) have now been dispelled and I am very happy with the choice.

f. Excerpts from David Smith's review, Sea Kayaker, Vol. 2. No.2. - Canada.

THE SEA TIGER - NO PUSSYCAT!

AND NOW, for something not completely, but substantially different: the Sea Tiger, (...)

(....) let's talk about how it actually paddles. (....) I was pleasantly surprised at its stability: initial stability laterally is just fine, and secondary stability is superb. I doubt that anyone will ever describe it as a tippy boat. Unlike just about any other touring boat I can think of paddling the Sea Tiger in surf was a genuine pleasure. With the skeg raised, it has to be one of the most, if not the most maneuvrable touring boat around. Yet, lower the skeg, and it tracks like a train. Good surf characteristics and good tracking ability are a rare combination indeed. (....)

(....) The skeg itself is not mounted on the stern, but two feet forward. Again, I have to give this particular skeg high marks. It is easy to adjust to different levels for just the right condition of following or quartering sea. With the stern mounted skeg or rudder, the amount of skeg or rudder that is in the water is continually changing as the boat bobs around; not so on the Sea Tiger, and this enables the fine tuning to specific conditions that I have not experienced before. Because of this and the resulting diminished need for manouvering strokes, it is probably faster in rough conditions than a number of longer boats with a stern mounted skeg, and, of course, you have to put out less energy. (...)

(....) Co-designer Nick Padwick's favourite rescue is the half sommersault - face the stern under water holding the boat by the rails and do a half backwards sommersault into the cockpit, then roll up. There won't be enough water in the pod to necessitate bailing or pumping, so all you have to do is fasten the spray skirt and presto, you are back paddling a stable boat. I have done this a few times, and it's not as difficult as it may sound. With other boats the most difficult part has always been controlling the boat while doing the sommersault. No longer: the rails provide a sure grip, and they make it easy to turn the boat into the wind, or to whatever angle seems easiest. It works like a charm. (...)

(....) The Sea Tiger is a refreshing change from boats available in the North American market today. It is also different from anything we have seen come out of the U.K. for a long time. (....) Its manufacturers' concern for safety is evident throughout and will no doubt provide U.S. and Canadian designers food for thought. (....)

g. G.K. 8/11/89. The kayak was found to be very buoyant and very stable by several beginners who have only been canoeing for three months. They much preferred it to the Kayaks which they usually paddle .... The canoe was filled with water in the hatches to simulate swamping from a crack or hole below the waterline. It was still paddleable with approximately 150lbs of water aboard and a 12 stone paddler. At 200lbs it was barely paddleable but was still fairly high in the water .... The test was carried out in force 3 conditions in short steep waves and there was no problem encountered in water rushing from bow to stern provided one was aware of the sloshing action in dipping the bow and stern alternately. With 150lbs of water aboard it was quite fun actually ...

h. R.G. 6/8/90. .... I had a lot of fun up North, exploring caves, taking photographs, fishing and surfing - no other canoe would have done so well.

8. FOOTNOTE

We have attempted to provide a kayak which is extremely versatile in normal operation by concentrating on the essentials of good stability, manoeuvrability and ease of control. These facilities all help to reduce incidents from occuring but, if a problem does occur, the added safety features and rescue facilities should increase the chance of a very speedy and successful rescue operation. Anything that reduces the risks improves safety, but this does imply knowledge and ability to make use of the advantages provided. Only the individual paddler can provide that. Many experienced **SEA TIGER** users have expressed their approval and, we trust, any who carry out the suggested tests will also find the benefits for themselves.

All this does not mean that problems will not occur - they will. It is the nature of the sport and the elements can be unrelenting. We are not complacent - nothing is perfect and there is always room for improvement. As was the case during the long development period of the **SEA TIGER**, criticism, comment and ideas are always welcome and if these lead to viable improvements then every effort will be made to incorporate them.

Finally, the kayak is the interface between the kayaker and the sea. Immersion of the kayaker in the sea should be minimal, unless in practise conditions. The design of the **SEA TIGER**, when combined with the kayaker's expertise, is intended to promote this. Keep practising for it is worth remembering:

THE SEA NEVER GETS TIRED AND NEVER FEELS THE COLD.

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