

Instructions for retro-fitting Kari-Tek Skeg Rudder System®

A good knowledge of fibreglassing will be required to fit the Skeg Rudder System® successfully.

When working with fibreglass and cutting the holes, safety glasses, gloves and a face mask should be worn.

The main stages involved in fitting your Skeg Rudder System® are:

- Cut the holes for the glide box and skeg box
- Glass the glide and skeg boxes in place
- Fit the glide cylinder and skeg cassette
- Fit the tiller block
- Connect the Skeg Rudder System®
- Bleed and adjust the Skeg Rudder System®



Skeg Rudder System® kit

Component List

Your Skeg Rudder System® kit contains the following:

Skeg box assembly, fitted with temporary timber spacer

Tiller block and rail assembly

Skeg Rudder cassette assembly

Rudder actuator ram assembly

Glide box

Glide cylinder assembly

Bleed kit (feed tube, drain tube)

Two lengths 4mm nylon tube (skeg) green, clear

Two lengths 4mm nylon tube (rudder) red, blue

Two 1/8" BSP/4mm compression couplings

One long (M6x40) SS countersunk socket head screws

Four short (M6x20) SS countersunk socket head screws

Two short (M5x20) SS countersunk socket head screws

One short (M6x20) SS domed head screw

One M6 nyloc nut

Two M6 half nuts

Three 19mm diameter rubber-bonded washers

Skeg Rudder System® stickers

Two small clamps (spring loaded clothes pegs)

Set of tube clips

Tools and Materials required

The following tools are needed to fit the Skeg Rudder System® into your kayak:

Dremel tool or electric jigsaw to cut holes in the kayak deck and hull for the skeg and glide boxes

Fibreglassing kit including acetone, polyester resin, hardener, fibreglass matting

Gelcoat

Pigment to match kayak hull colour

4mm allen key

10mm, 11mm and 13mm spanners

Water bottle

Drill bits: 4mm, 6mm and countersinking bits

Marker pen

Anti-freeze

Masking tape

Basin

Duct tape

Sandpaper

Sikaflex

ABS solvent cement

Junior hacksaw

Sharp knife

Foam rubber blocks

1. Cut the hole for the glide box

- If your kayak already has a deck mounted skeg slider, then disconnect the existing skeg wires and remove the slider components.
- Mark out the position of the new glide box on the deck, positioned so that you can reach the glide comfortably when sat in the cockpit. If your kayak already has a deck mounted skeg slider hole then you will need to mark the position of the new box so as to best overlap that of the existing hole.
- Cut out the hole neatly through the deck to match the recessed part of the glide box and clean up any ragged edges.
- Place the glide box into the hole with the hole for the cylinder facing towards the stern of the kayak, then loosely assemble the glide cylinder into the glide box to check the fit.
- Mark the flange's position on top of the deck with masking tape. Sandpaper up to the edge of the masking tape to roughen the surface.



Glide box cut out on deck

- Cut out the hole neatly through the hull
Tip! Cut the hole on the small size and clean up the edges so that the new skeg box has a tight fit: the tighter the fit now the less finishing later on.
- Turn the kayak over.
- Place the new skeg box containing the timber spacer through the hull from the inside ensuring that the flange on the skeg box is a good fit in the keel.
- Clean out all the cuttings and fibreglass dust from the inside of the kayak. Wipe the inside of the kayak around the edge of the hole with acetone.
- Dummy fit the skeg mechanism to the skeg box and fit temporarily into the hull. With the skeg lowered check the alignment both vertically and longitudinally.



Skeg box cut out in hull

2. Cut the hole for the skeg box

- If your kayak already has a skeg fitted, you should disconnect and discard the existing components.
- Turn the kayak upside down. Position the new skeg box (upside down) on the hull at the stern of the kayak along the keel line and mark round the edge of the skeg box. **Ensure that when the skeg box is positioned in the hull you will be able to reach the back of the skeg box through the rear hatch.** If your kayak already has a skeg fitted then ensure that the outline of the new hole best overlaps the existing hole.



Skeg box positioned for marking out

3. Glass the new glide and skeg boxes in place

- Place Sikaflex around the underside of the glide box flange and push into place, with the brass insert towards the stern of the boat. Clean up any excess Sikaflex from around the edge of glide box and remove the masking tape.
- Prepare the materials for fibreglassing. Cut strips of fibreglass mat 5cm (2") wide and long enough to go around the base of the skeg box and to give a couple of tabs for the glide box.
Tip! Wrap the upper section of the skeg box in clingfilm beforehand for a clean finish.



Glide box in place in deck

3. Glass the new glide and skeg boxes in place (continued)

- Paint the base of the skeg box (see hatched area in picture) liberally with ABS solvent cement.
- Immediately overpaint the same area of the skeg box with polyester resin and hardener.
- Place the skeg box into the hole in the hull, making sure that the skeg box is in the centre of the kayak and is vertical (wedge in place with foam rubber blocks: see picture).
- Mix sufficient resin and hardener and then lay up the fibreglass mat strips between the skeg box and the hull of the kayak. *Tip! Butt one edge of the mat strip against the flange on the side of the skeg box for a neat finish.*
- In the same way, glass a couple of tabs between the underside of the glide box and the inside of the deck.
- Leave until the fibreglass has gone hard (24 hours should be long enough).
- Turn the kayak over and trim the edge of the new skeg box neatly back until it is in line with the kayak's hull. Clean up around the edge of the skeg box, then finish off with gelcoat in the same method as laying up a keel rubbing strip (see picture).
- Remove the timber spacer from the skeg box.



Skeg box: hatching shows where to apply cement



Skeg box wedged in hull with rubber blocks



Gelcoat around finished skeg

4. Fit the glide cylinder & skeg rudder cassette

- Dismantle all the fittings from the glide cylinder including the glide button leaving only the cylinder and lock nut



(see picture)

Tip! Press down on the coloured collar to release the tubes from the fittings. To reconnect, just push the end of the tube back into the fitting.

- Push the piston rod of the cylinder from the inside of the cockpit out through the hole in the glide box

- Screw the glide button back on to the end of the piston rod and tighten up the locknut.



Glide cylinder inside cockpit

- Working from inside the cockpit, screw the glide piston into the brass insert in the end of the glide box so that the face of the cylinder just protrudes into the glide box by about 0.5mm (1/32"). Thread and tighten the cylinder lock nut, finger tight only at this stage.
- Re-fit the two T connectors onto the cylinder, aligning them along the body of the cylinder. (*Tip! Take care not to overtighten the connectors: tighten finger tight only then tighten a further quarter turn with a spanner*).
- Rotate the cylinder so that the hole in the back end of the cylinder is perpendicular to the deck of the kayak at the point closest to the cylinder. From the inside of the kayak cockpit, drill a 6mm diameter hole through the kayak's deck using the hole in the end of the cylinder as a guide. Countersink the hole from the outside.
- Place the long stainless steel countersunk socket head setscrew through the kayak deck. From the inside of the cockpit, thread the 19mm rubber-bonded washer onto the setscrew with the rubber side facing out towards the inside of the kayak deck.

4. Fit the glide cylinder & skeg rudder cassette (continued)

- Thread the 2 half nuts onto the setscrew, then pass the end of the screw through the hole in the back of the cylinder.

Tip! See picture for order in which items are threaded onto the setscrew.



- Tighten up the outermost half nut onto the rubber-bonded washer to make a watertight seal against the kayak deck. Run the other half nut up against the side of the cylinder, then screw the M6 nyloc nut onto the end of the setscrew and tighten up against the side of the cylinder. Tighten the cylinder locknut fully.
- With a junior hacksaw, cut any excess off the tail of the setscrew.

- Drill two 4mm diameter holes through the bulkheads between the cockpit and the rear hatch, and push the two 4mm nylon tubes through the holes.

Tip! You may be able to reuse holes from your previous skeg

installation, but otherwise drill the holes high up in the corner of the bulkheads for a neat finish (see picture).

Take care when drilling the holes not to drill through the kayak deck!

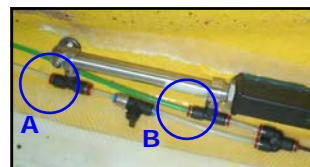
- Screw the two 1/8" BSP compression couplings into the two holes on the nose of the skeg box. *Tip! Make sure not to lose the olives from inside the compression couplings.*



Example of tube routing through bulkhead immediately below deck

5. Connect the skeg hydraulic system

- Reconnect the short lengths of tubing to the glide cylinder as shown on the picture. Do the same with the ends of the long lengths of tubing at the glide box end (in the cockpit). The clear tube connects to the T connector furthest from the glide box (A: see *Green and clear tubes connected to glide cylinder* picture), the green tube to the other (B).



Green and clear tubes connected to glide cylinder

- Working inside the rear hatch, feed the other ends of the two long lengths of tubing through the compression couplings in the front of the skeg box as shown. The clear tube should be run through the fitting nearest the bottom of the kayak hull.

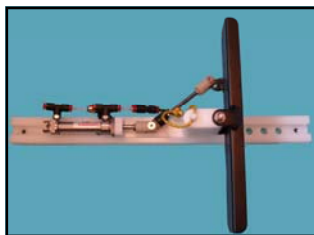


Green and clear tubes connected to skeg box

- Feed tubing through the skeg box couplings until you are happy with the routing of the tubes, making sure that there is enough nylon tubing in each hatch to allow the tubing to follow a neat path along the side of the hull when it is finally secured later.
- Mark tubing with a marker pen at the face of the compression coupling, then temporarily pull the tubes back out from the coupling.
- With a sharp knife, cut the tubes 25.5cm (green tube) and 37cm (clear tube) beyond the points you have just marked. **Take care not to cut tube too short!**
- Push the tubes back through their respective compression couplings, but do not tighten the fittings yet: for the moment leave the tubes sticking out through the bottom of the skeg box.

6. Fit the tiller block

- The tiller pedal mounts on a ladder rail attached to the underside of the kayak cockpit. A sprung locking pin allows the position of the pedal on the rail to be adjusted.



Tiller pedal mounted on the ladder rail as supplied. The forward end of the rail is to the right in this image.

The rail needs to be

fitted in the cockpit in a position which allows the required range of fore and aft adjustment of the pedal position. The precise location is a matter of personal preference,

but you may find it useful to decide where to mount the rail in comparison with the existing position of your foot pegs. The forward end of the rail



Example tiller block installation showing tiller pedal in relation to footpegs.

must be at least 70mm aft of the bulkhead to allow enough room for the operating tubes.

- Once you have decided how far forward from the cockpit rim the ladder rail should be mounted, use the rail as a template to drill two 6mm diameter holes in the front deck, aligned with the tapped holes in the ladder rail.
- Countersink the holes and then attach the rail to the underside of the deck using two of the M6x20 screws provided.

- Connect the tiller block ram to the operating pedal using one of the M5x20 countersunk screws provided.



Connecting tiller block ram to operating pedal. This is best done with the block removed from the rail.

- Mount the tiller block onto the ladder rail and double check that the range of positions fore and aft for the operating pedal is as required.

7. Connect the rudder hydraulic system

- Working inside the cockpit, connect one end of the red and one end of the blue tube to the tiller block ram outlet ports. The ram is supplied with short stubs of hose to indicate which tube should be connected to which tube. The stubs can be removed by pressing down on the coloured plastic collar round the port, and may then be discarded. The ends of the tubes are a simple push fit into the outlet ports.

- Arrange the tubes to run towards the bow of the kayak as they leave the tiller block, and then loop them round to run towards the stern alongside the glide box as shown.



Routing of red and blue tubes from tiller block

Hold them in position using one of the clips provided. Make sure that there is enough tube to allow the full range of movement of the tiller block on the ladder rail without fouling the footpegs or kinking the tubes.

- Route the tubes neatly aft from the cockpit to the back hatch, drilling holes in the bulkhead(s) where necessary. The clips supplied may be used to secure the tubes to the kayak.

Tip! As for the skeg operating tubes, you may be able to reuse holes from your previous skeg installation, but otherwise drill the holes high up in the corner of the bulkheads for a neat finish (see picture).

Take care when drilling the holes not to drill through the kayak deck!



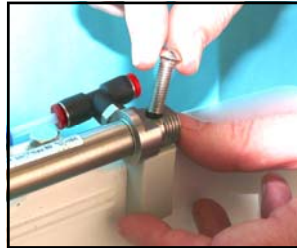
- The next step is to attach the rudder actuator ram assembly to the top of the skeg box.

Rudder actuator ram assembly as supplied. The ram attaches to the top of the skeg box using the hole in the body of the ram, shown on the right in this image.

7. Connect the rudder hydraulic system (continued)

- Working inside the back hatch, use the M6x20

domed head screw provided to attach the actuator ram to the tapped hole in the block on top of the skeg box. Position the ram with its connecting arm facing forward in the kayak, and



Attach ram to tapped block on top of skeg box.

with the T pieces over the top skeg box as shown. Take care not to overtighten the screw.

- Still inside the back hatch, attach the connecting arm of the rudder actuator ram to the crank arm protruding from the top of the skeg box using one of the M5x20 countersunk screws provided as shown. Again, take care not to overtighten.



Attach actuator arm to rudder shaft crank arm.

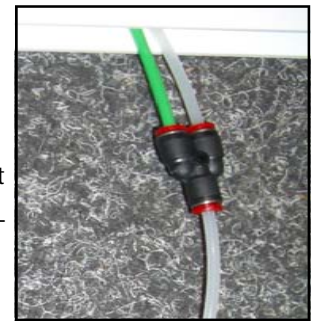
- Now route the red and blue tubes to the hydraulic ports on the rudder actuating ram; the tubes loop round and connect to the ports from the stern of the kayak. The ram is supplied with stubs of tube in each port indicating which colour of tube should connect to which port. These stubs can be removed by pressing down on the coloured plastic collar round the port, and may then be discarded.
- Once you are entirely happy with the routing of the tubes to the ram ports, mark and cut them to length. The ends of the tubes are then a simple push fit into the outlet ports.
- This completes the assembly of the Skeg Rudder System—it only remains to bleed the skeg and rudder hydraulic systems.

8. Bleed the skeg hydraulic system

- The two hydraulic systems are now filled and bled, beginning with the skeg system.

- Open the bleed kit supplied and connect the

bleed kit drain tube to the tubes at the skeg box end: simply take the two loose ends of the tubes, which you left sticking through the bottom of the skeg box, and push them into the



Bleed kit Y piece connected to tubes protruding from underneath skeg box

shown. Place the end of the drain tube into a receptacle suitable to catch excess fluid.

- At the glide box end, open the bypass valve. The valve is open when the operating lever is aligned along the tube.



Closeup of bypass valve, shown in open position

- Remove the blanking plug from the 'Y' piece at the glide box (see picture)

- Put the blanking plug to one side – it will be needed again shortly!



Blanking plug at glide box end

- Fit the end of the bleed kit feed tube into the 'Y' piece in place of the blanking plug. Fit the



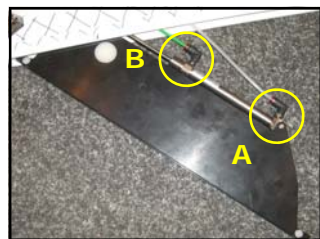
Blanking plug after removal: don't lose this!

other end onto a water bottle or similar. *Tip! The bleed kit feed tube is supplied with a fitting which connects directly onto a Platypus type water bottle drinking tube.*

- As when bleeding the skeg system, clamp shut the soft part of the feed tube. Have a second clamp to hand ready for use on the drain tube.

8. Bleed the skeg hydraulic system (continued)

- Fill the water bottle with a solution of 75% water and 25% anti-freeze and secure above the kayak. *Tip! the higher up the water bottle, the more efficient will be the bleeding process.*
- Remove the clamp from the feed tube to allow the fluid to flow through the system, collecting in the receptacle at the drain tube end.
- While the fluid is flowing through both tubes, slide the glide button forwards and backwards to expel all air from the glide cylinder and tubes. Repeat if necessary until no more air bubbles are seen emerging from the drain tube.
- Place the clamps onto the soft parts of the drain tube first and secondly the feed tube.
- The final part of the bleeding process is to bleed the skeg operating cylinder, which is done before fitting to the kayak. Place the skeg cassette in a tub or basin of water and move the skeg blade up and down to expel all air out of the cylinder. When no more bubbles emerge, close the skeg blade while the cassette is still under the water.
- Remove the skeg cassette from the water and take to the kayak. Disconnect the green tube from the drain tube 'Y' piece and immediately plug it into the elbow nearest the skeg hinge (port B: see picture) on the cassette cylinder.
- Repeat for the clear tube, plugging it into the other elbow (port A).
- Slide the skeg cassette into the skeg box making sure that the tubes are not twisted and that one runs either side of the rudder pivot shaft inside the skeg box.
- Secure in place with two short stainless steel countersunk socket head setscrews. Manually move the skeg blade to the up (retracted) position.
- Remove the bleed kit feed tube from the glide



Sliding the skeg cassette into the box: note position of the green and clear tubes

- cylinder 'Y' connector and replace the blanking plug. Slide the glide button to the up position (nearest the stern of the kayak). Close the by-pass valve by the glide cylinder: the valve is closed when the operating lever is at right angles to the tube.
- Working from inside the rear hatch, gently push the two tubes through the compression couplings to their full extent, to ensure that they do not interfere with the operation of the skeg blade.
- Tighten the compression couplings, taking care not to overtighten: tighten by hand first, and then a further quarter turn with a spanner.
- If you have not done so, fix the tubes to the inside of the hull to stop them from getting snagged when loading the hatches using the clips provided.

9. Adjust the skeg hydraulic system

- Push the glide button forward to deploy the skeg and then move it fully back to retract it again. If the skeg blade does not fully return into the skeg box, or if the blade does not fully deploy, then adjust as follows.
- Push the blade into the box manually, then temporarily open the bypass valve (The valve is open when the operating lever is aligned along the tube.)
- Slide the glide button slightly forward towards the skeg down position and close the bypass valve again.
- Push the glide button forward to operate the skeg again and repeat the previous step if necessary. The blade must deploy fully for the rudder tiller to operate.
- It now remains to bleed and adjust the rudder hydraulic system in a similar way.



Operating the glide button

10. Bleed the rudder hydraulic system

- Remove the 'Y' piece from the bleed kit drain tube, by pressing down on the coloured collar to release the tube.
- Working inside the rear hatch, open the bypass valve at the rudder actuating ram. The valve is open when the operating lever is aligned along the tube.

Closeup of bypass valve, shown in open position
- Remove the blanking plug from the 'Y' piece at the rudder actuator ram, in the same way as you did earlier for the blanking plug at the glide box. Put the blanking plug to one side – it will be needed again shortly!
- Fit one end of the bleed kit drain tube into the 'Y' piece in place of the blanking plug and place the other end of the tube into a receptacle suitable to catch excess fluid.
- Working inside the cockpit, open the bypass valve at the tiller block. The valve is open when the operating lever is aligned along the tube.
- Remove the blanking plug from the 'Y' piece at the tiller block. Put this blanking plug to one side also– it too will be needed again shortly!
- Clamp closed the soft part of the bleed kit feed tube, and if necessary, refill the feed container. Have the second clamp to hand ready for use on the drain tube.
- Fit the end of the bleed kit feed tube into the 'Y' piece at the tiller block in place of the blanking plug.
- Remove the clamp from the feed tube to allow the fluid to flow through the system, collecting in the receptacle at the drain tube end.
- While the fluid is flowing through both tubes, move the tiller pedal repeatedly through its full

range to expel all air from the tiller operating cylinder. Continue until no more air bubbles are seen emerging from the drain tube.

- Move the skeg glide button to fully deploy the skeg rudder blade. Grasp the blade and turn it from left to right through its full operating range repeatedly until no more air bubbles are seen emerging from the drain tube.

Skeg rudder blade deployed
- Clamp the drain tube closed with the second clamp, then clamp the feed tube closed also.
- Close the bypass valve at the rudder actuating ram in the back hatch, press down on the coloured collar on the 'Y' piece to release the drain tube and refit the blanking plug.
- Close the bypass valve at the tiller block in the cockpit, press down on the coloured collar on the 'Y' piece to release the feed tube and refit the blanking plug.

11. Adjust the rudder hydraulic system

- The final step is to adjust the rudder hydraulic system. Using the tiller pedal with the skeg rudder fully lowered, check that the rudder operates through its full range and that centre position on the pedal corresponds to the rudder blade being aligned straight fore and aft.
- If the centre position on the blade and pedal do not match then open the bypass valve at the tiller block, centre the tiller and rudder blade by hand then close the valve again.
- Your Skeg Rudder System® is now ready for use!