

HOW TO RIG ROWING BOATS

By J. Croly November 2009

WHAT YOU NEED:

Before rigging a boat you should have the following equipment available:

- Pitch Gauge
- Short Spirit level
- Long Spirit Level (1.5-1.7m)
- Adjustable Spanner – at least 22mm
- A variety of spanners – size 10, 13, 17, 19, 21 should be enough for all rigger types you will encounter.
- Tape Measure – a 5-meter tape is best as you can easily measure the length of sweep blades.
- A Flat and Phillips (star) screwdriver.
- Pitch Inserts – these vary for sweep and sculling and for different pin sizes.
- Height Stick or 1.8m long piece of straight metal bar (long spirit level).

HOW TO RIG A BOAT

The first thing to decide upon when rigging your boat is the settings that you will use. You should consider the height of the rower/s and the boat class they will be rowing in.

This guide will assume that you are starting from scratch and are not simply altering the previous rig of the boat.

Before you start rigging remove the backstay, the swivel and any height washers from the pin.

The first variable that should be set is the span/spread.

Spread – Sweep Boats

1. Measure the distance from one side of the boat to the other in line with the line of work. The line of work is the perpendicular line to the boat intersecting the face of the swivel. This usually corresponds to the middle rib (shoulder) of the position but not always. In wing rigger boats the middle rib will be absent.
2. Divide that measurement in half to find the midpoint of the boat. Then holding the end of the tape at the midpoint measure the spread of the boat. This measurement is from the midline of the boat to the centre of the bottom of the pin. You must measure it exactly to the millimetre. It is important to measure to the bottom of the pin as lateral pitch will effect the spread if measured at the top of the pin
3. Work out how much the existing measurement differs from the measurement you decided on before beginning the rigging session.
4. Loosen the nuts holding the pin and move it to the desired position. Then recheck the spread. Continue to adjust the pin until it is exactly, to the millimetre in the right position. It may be easier to get the final adjustment right if somebody else hold the tape while you tighten the nuts slightly and tap the pin into position with a spanner.
5. Tighten the nuts holding the pin and then recheck the spread to make sure nothing moved while you were tightening the nuts.
- 6.

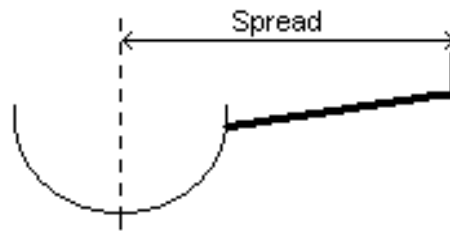


Figure 1.1 The measurement of spread

Span – Sculling Boats

1. Measure the distance from the centre of the bottom of one pin to the centre of the bottom of the other. It is necessary for two people to do this. Compare this measurement to the one you chose before the rigging session. Calculate how much this differs by. Divide this measurement by two. This is the distance that you must move each individual pin (a).
2. In sculling boats particularly the single and double the saxboards are often much lower than the pins so it is not appropriate to measure the span as you would for sweep boats.
3. Measure the distance from either one of the slide rails or the opposite saxboard to the centre of the pin. These measurements should be exactly equidistant from the centreline as the opposite side. If you discover that they aren't take the boat back to the manufacturer and have it fixed. The slide bed is a safer option because the saxboards may vary in thickness slightly or may have become damaged through misuse.
4. Move the pin the distance (a) from the measurement you have just made. Repeat on the other pin. If you have done this correctly and your boat does not have any major structural problems you will have the required span and your pins will be equidistant from the centreline of the boat.

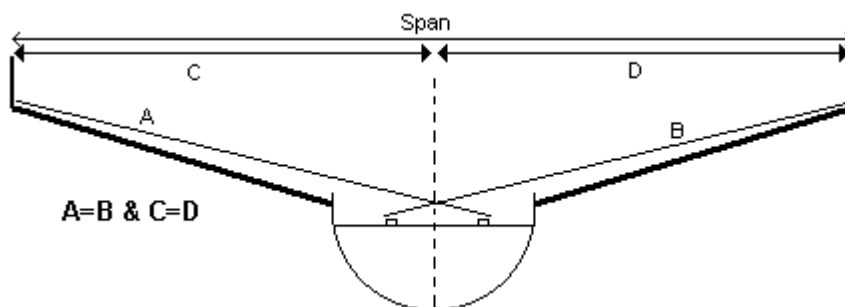


Figure 1.2 The measurement of span

The second variable that should be set is the pitch

The pitch consists of changing 3 different measurements: the stern pitch of the pin, the lateral pitch of the pin and the pitch of the swivel.

Stern Pitch of the Pin

1. Place the boat on a fairly level surface. It does not need to be completely level as you are measuring the pitch of the pin in relation to the boat.
2. Zero the pitch gauge (first place the swivel arm on zero) by placing it flat down on the deck of the boat and adjusting the bubble until it is centred. If you row an old wooden boat with no deck place the swivel on the saxboard provided it is not damaged, or on the small wooden sills on the side of the boat. In single sculls (and most other boats) you may place the pitch gauge on the bottom of the boat between the footboard channel and the middle rib.
3. Place the pitch gauge against the pin parallel to the centreline of the boat and facing the stern. Move the swivel until the level is centered and read the pitch.
4. Depending on how your riggers are built there are several methods of adjusting the pitch.
 - a) Older Neaves type riggers - Loosen the nuts on the block holding the pin and move it to change the pitch in the desired direction.

- b) Empacher/Filippi/BBG/newer Neaves riggers – This will probably involve having to bend the rigger until the pin is returned to 0. A device called a “rigger jigger” or “truth” is needed. This looks like an axe handle with a metal claw on the end that fits around the pin at where it fastens onto the rigger.
 - c) Carl Douglas riggers – Adjust the pitch by rotating the yellow swivels until you have the pitch you need.
5. I suggest that you set all the stern pitches at 0 degrees in boats that have gates with swivel inserts. If you have purchased a new boat and the pitch on your pins is more than 2 degrees out take the boat back and insist on new riggers that are correctly pitched. You have just spent an enormous amount of money on a boat and if it is not right get it fixed now. You would not accept a new car with a faulty clutch so why compromise on your boat.
6. When the pitch is at 0 degree tighten up all the locking nuts. Remeasure to make sure that you have not moved anything while tightening.

Lateral Pitch of the Pin

1. Decide if you want to row with lateral pitch on your pins. Remember that 1 degree of positive lateral pitch (top of the pin away from the boat) will equate to about ½ degree more pitch at the catch and ½ degree less at the finish. By giving novice athletes 2 degrees of positive lateral pitch you can make it easier for them to catch and finish. However as they become more skilled no more than 1 degree positive lateral pitch is necessary.
2. Place a spirit level on the deck of the boat and level the boat laterally (side to side movement).
 - a) Have somebody hold the boat so that the perpendicular level is centered. They must ensure that the level does not move while you measure the pitch. By using this method even if the boat is bumped the person can return the level to centre and you can continue with the measurement.
 - b) Strap the boat to the trestles so that it does not rock side to side.
3. Place the pitch gauge perpendicular to the centreline and zero it. Then move to the pin and measure the lateral pitch with the pitch gauge on the outside of the pin.
4. Loosen the nuts holding the plate for lateral pitch and adjust the pitch in a similar way to that of stern pitch.

How to use pitch inserts

The pitch can be adjusted from 1 to 7 degrees by selecting two inserts with the desired pitch imprinted and inserting them in opposite directions as shown in the diagram.

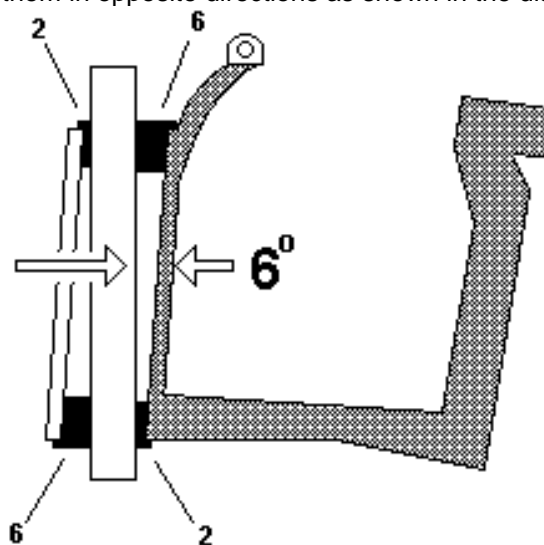


Figure 1.3 How to use pitch inserts

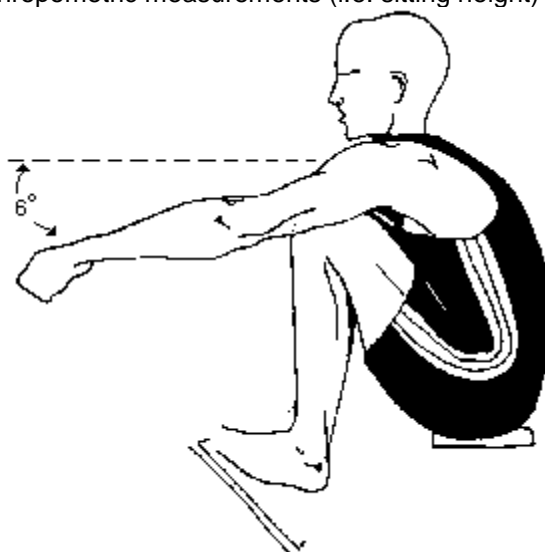
It must be noted that worn pitch inserts and worn swivels will affect the pitch on the oar. It is suggested that swivels be replaced at least every 2 seasons or sooner if the boat undergo a lot of use as is the case with schools. Worn swivels can be compensated for by changing the pitch of the pin but this is not satisfactory. If swivels are badly worn the pitch on the oar can change during the stroke.

The third variable to set is the height

Height

There are two methods of doing this:

1. Sit the athletes in the boat, have them sit at front stops with only the spoon buried in the water. Adjust the height of the swivel until their arms form an angle of ± 6 degrees below the horizontal, still with only the spoon in the water. At this level the athlete will be in the optimal biomechanical position to apply force on the oar. This is a time consuming process but as it only needs to be done once after a crew has been selected it is worth the effort. This method takes into account the size of the boat, the weight of the athletes as well as their anthropometric measurements (i.e. sitting height)



Modified from Redgrave 1992

Figure 1.4 The biomechanically correct measurement of height

2. The other method is to set up all the athletes to one common measurement. To do this take all the washers out from under the swivel and place the swivel back on the pin. Using a height stick measure the height of the gate. Raise the gate the appropriate height so that it corresponds to the measurement you decided on.

It must be remembered that this does not take into consideration the size or weight of the crew or the size of the boat. It is not uncommon to see junior's ($\pm 50-70$ kg) set up too high because the recommended height 17-18cm often translates in 20+cm of height because they are rowing in a boat designed for heavyweight men ($\pm 90-100$ kg). When ordering new boats, especially when they are intended for u14 & u15 boys and girls who rarely weigh more than 40-60kg) it may be worth considering talking to your boat builder about having the decks built lower than normal. (Fig 11.5)

Example: Girl's u14 quad = $4 \times 45\text{kg} + 40\text{kg cox} = 220\text{kg}$
 If they row in a boat designed for lightweight men (70kg)
 Lightweight Men = $4 \times 70\text{kg} = 280\text{kg}$
 Difference = 60Kg

If they row in a boat designed for heavyweight men (90kg)
 Heavyweight Men = $4 \times 90\text{kg} = 360\text{kg}$
 Difference = 140kg!!

By sitting higher out of the water the boat will be much harder to balance as the centre of gravity is raised and this increases the difficulty of learning to row correctly. Coaches and administrators should do everything possible to make learning to row as easy as possible by providing correctly sized equipment.

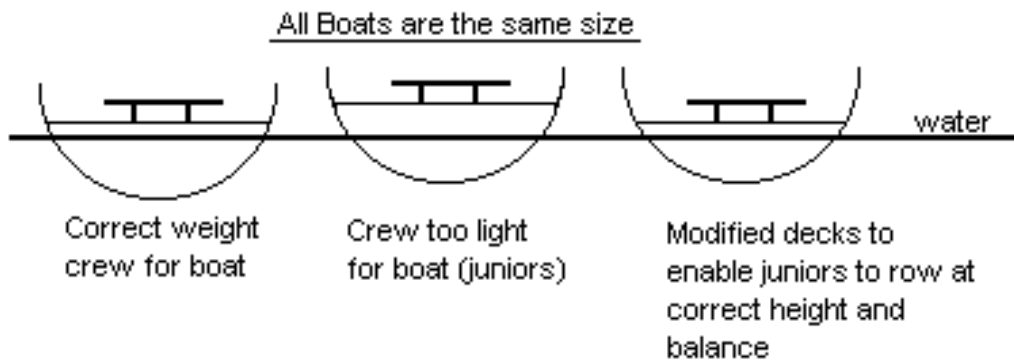


Fig 1.5 Modifications to boats allowing correct rigging & rowing

How to measure Height

1. Place the swivel on the bottom of the pin with no washers under it.
2. Place a height stick (parallelogram type) across the saxboards with the free end of the top bar on the bottom of the middle of the swivel. Measure the distance from the lowest part of the front of the slide to the bottom of the top bar of the height stick. This is the effective measurement of the height of the swivel. The true measurement is from the bottom of the middle of the swivel to the waterline, but this is extremely hard to measure. Then adjust the height to where you want it by adding the appropriate amount of washers.

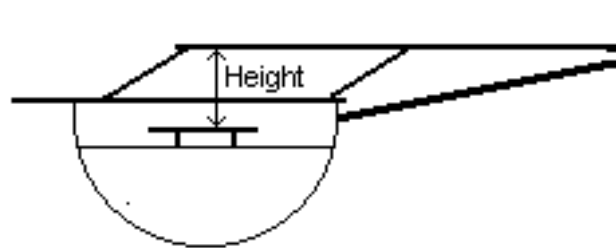


Figure 1.6 How to measure height - variation 1

3. If you do not have a height stick available but do have a 1.8m long straight piece of metal (spirit level) you can use that. The pole must be *exactly* straight otherwise your measurement will be wrong. Place the pole on the saxboard so that one end extends out under the gate. Measure the height from the bottom of the middle of the swivel to the bottom of the pole. Then measure the distance from the lowest part of the slide to the bottom of the pole. Add these together to get the height of the swivel.

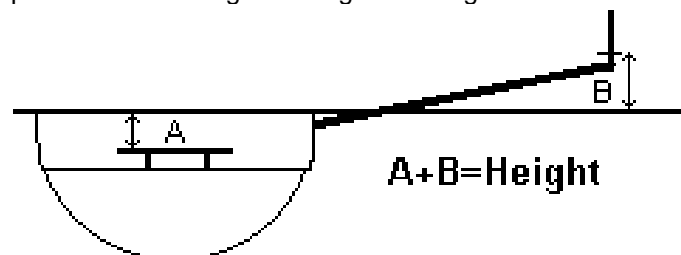


Figure 1.7 How to measure height - variation 2

In sculling boats one of the swivels must be set 5mm-15mm higher than the other in order to allow comfortable crossing of the hands during the drive and recovery. It is usually the left hand (bowside) swivel that is set higher.

The last variables to be adjusted are the athletes' positions within the boat

There are three measurements affecting the athletes' position within the boat: Height of the footboard and seat, rake of the footboard, and distance behind the work.

Height of the Footboard and Seat, and Rake of the Footboard

1. The height of the heels below the seat can be adjusted to allow the athlete to row comfortably. This range is usually between 16-20cm but can vary depending on the length of the individuals shins. Athletes with a disproportionate body length to leg length ratio will need special consideration. This is not uncommon to see in young athletes who are growing rapidly. To change this loosen the screws on the footplate and move it to another hole.
2. The rake of the footboard is the angle of the footboard. This measurement should be between 38-45 degrees depending on the flexibility of the athlete. Working on ankle flexibility is more appropriate than compromising the rig. Unfortunately this measurement is the hardest to change as most footboards are made without a way to change rake. If you buy a new boat specify that the rake must be adjustable. By putting spacers under the bottom bolt of the footboard you can reduce the angle of the footboard.

The Distance Behind the Work

The distance behind the work is probably the most controversial measurement in rowing. This distance changes the place in the stroke where the maximum power is generated, and changes the angle of the oar at the catch and finish.

Scullers should have their footboards adjusted in the horizontal position so they are in this position at the finish:



Sweep rowers should have their footboards adjusted in the horizontal position so they are in this position at the finish:



Checking the Pitch on the Oar

From Concept II April 1999

Macons and Big Blades

1. Find a flat piece of metal or wood on the edge of a stable structure (e.g. boat rack, edge of bench). This must have an even surface and be at least as long as your blade is wide.
2. Position a support to hold the oar off the bench and horizontal.
3. Place the blade of the oar face down on the surface, with the short side corner radius of the blade just off the edge of the surface for Big Blades. Macons can be placed with 2cm" of the blade tip off the edge of the block.
4. The centreline of the oar must be perpendicular to the level surface under the blade.
5. Position the pitch gauge on the level surface and zero it. Then keeping the pitch gauge facing the same way place it on the sleeve and adjust the arm until you can read the pitch.
6. You may fine-tune the pitch of the sleeve by filing or scraping down the wear plate surface. If the sleeve is more than 2 degrees out you should reconsider regluing the sleeve in the right position or buying new sleeves.

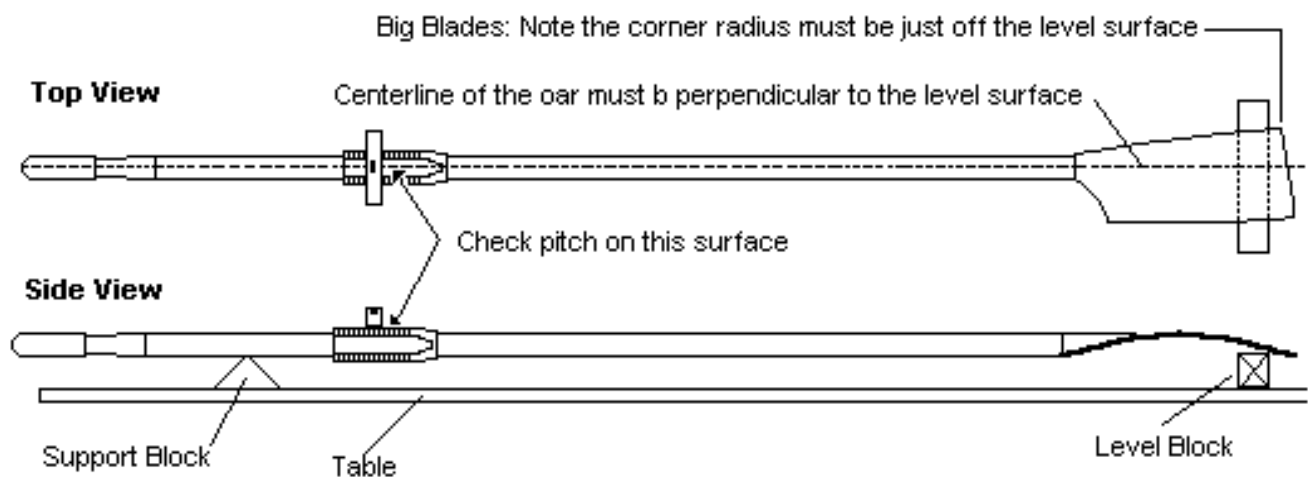


Figure 1.8 How to measure pitch on Big Blades

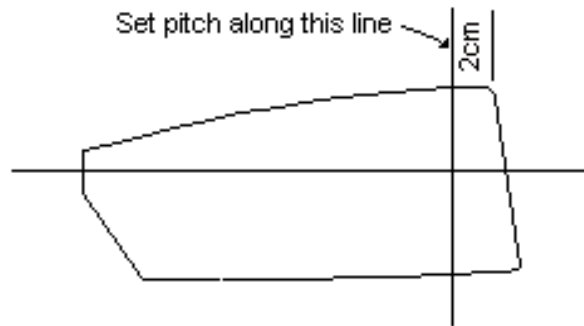


Figure 1.9 Where to measure pitch on Big Blades

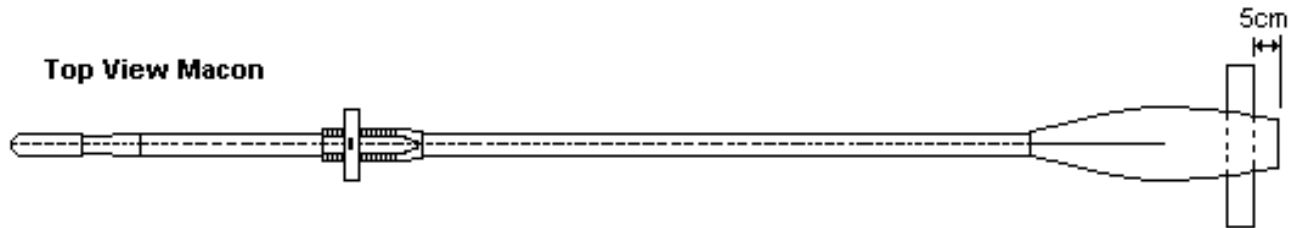


Figure 1.10 How to measure pitch on macons

Smoothies

1. When pitching smoothies you should follow the same procedure as for big blades but do not include the top curved portion of the blades.
2. The major surface of Smoothie blades is designed by Concept II to be at negative 3 degrees to the sleeve. The major surface of the blade should be at 2 degrees to the water. Therefore if you use an oar in a 5 degree oarlock then $(5 - 3 = 2)$ the major surface will be at 2 degrees relative to the water

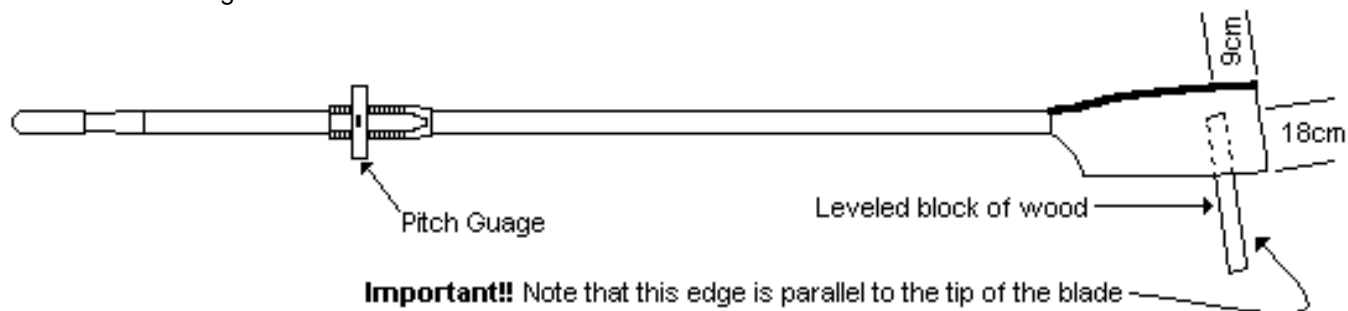


Figure 11.11 How to measure pitch on Smoothies – 1

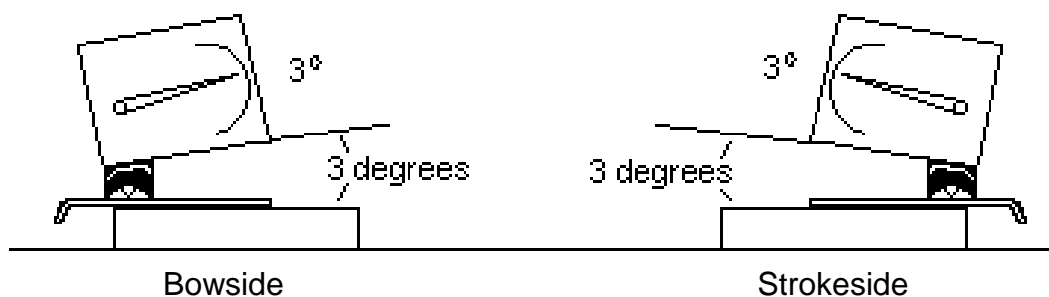


Figure 1.12 How to measure pitch on Smoothies - 2

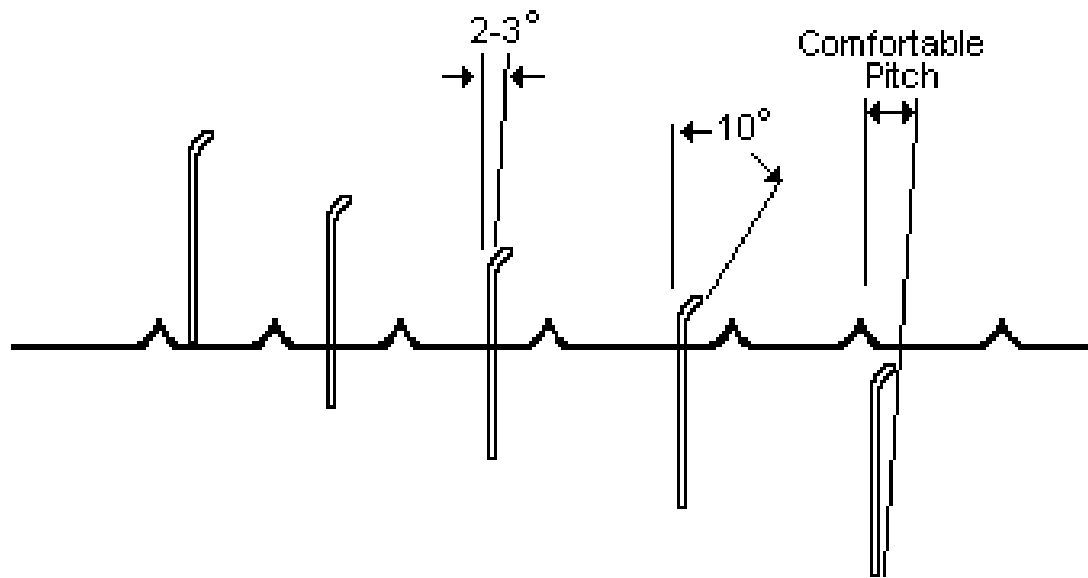


Figure 1.13 The pitch of the various surfaces of a Smoothie relative to the water