UKCC LEVEL 1 CERTIFICATE

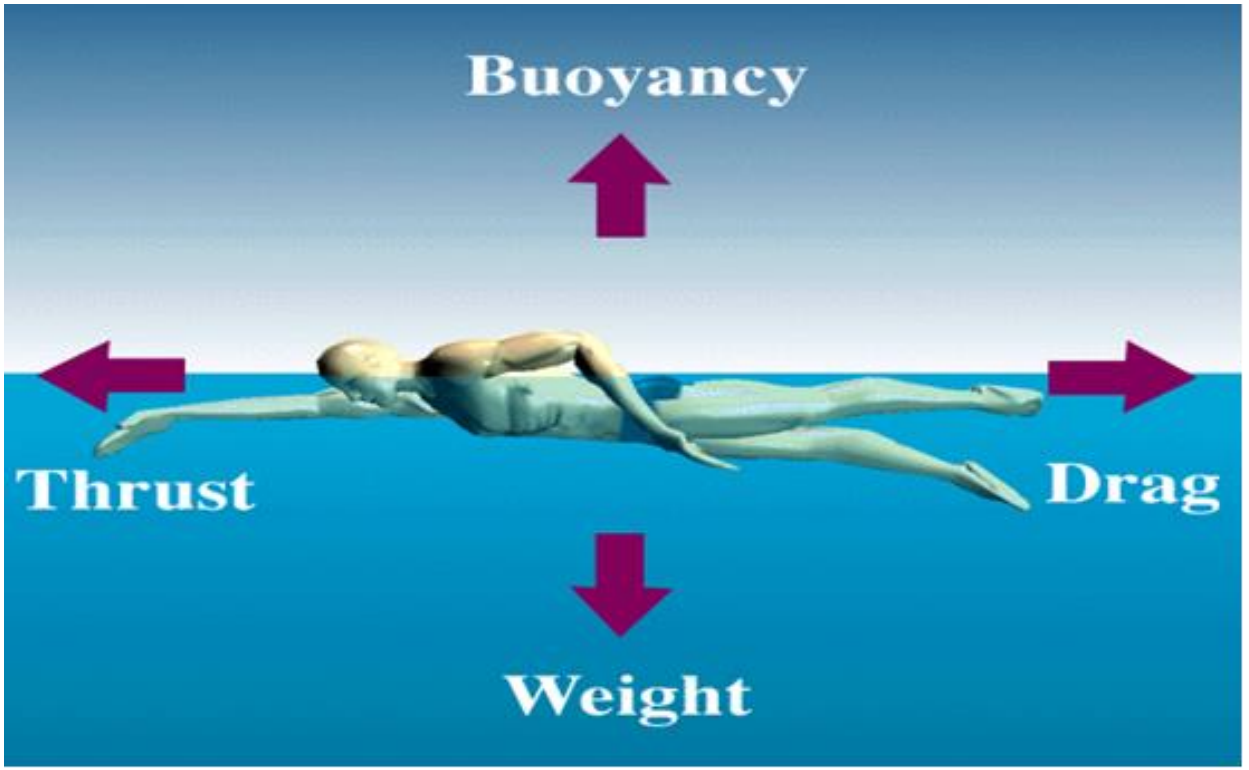
Unit 2

Teaching Aquatics - Techniques

Part 1 - Mechanics

Scottish Swimming

3 Aspects



Scottish Swimming

Mechanical Principles / Fundamentals of Swimming

Buoyancy / floatation

- Specific gravity
- Floatation

Resistance

- Frontal resistance
- Eddy currents
- Wave drag
- Viscous drag

Propulsion

- Paddle
- Propeller

Scottish Swimming

Buoyancy

Buoyancy or how well an object floats depends on its density compared to water:-

- The body has many different substances – some heavy / some light e.g. bone / fat – the different proportions that an individual has determines how well they float – their Specific Gravity.
- The Specific Gravity of fresh water = 1.
- The specific gravity of the human body relates to the S.G. of water.

Scottish Swimming

Specific Gravity - Human Body Versus Water

Different proportions of bone / fat / muscle mean we all have different weights / sizes.

- Fat = 0.92
- Bone = 1.80
- Muscle = 1.05

The SG of the human body is variable due to differences in the amount of fatty tissue / muscle development etc. In general females have more fatty tissue / natural fatty deposits in the breast and hips so float better than men.

- Males = 0.98 (average)
- Females = 0.97 (average)

Scottish Swimming

..... Cont.

Relationship between the body and the water:-

If S.G. of the human body is less than 1.0 (the S.G. of fresh water) it will float e.g.

- 0.98 – it will float with 2% of the body out of the water.
- 0.97 – it will float with 3% of the body out of the water.

The SG of water (fresh) = 1.0. The S.G. of sea water is 1.1+ i.e. it has more substance (dissolved salt) in it - depending on which sea e.g. the sea around our coast is at 1.02 SG or the Dead Sea at 1.16 SG. Thus floating in the sea is easier.

Scottish Swimming

Floatation …… do you float?

- **Mushroom float (with inhalation) = is the standard test of floatation**

  – If the swimmer has an area of their back = to the size of the face out of the water in the mushroom float they should be able to float in more useful positions / positions other than the ‘mushroom’ (with adjustments)

- **Good for teaching pupils about their floatation / personal level of buoyancy**

Scottish Swimming

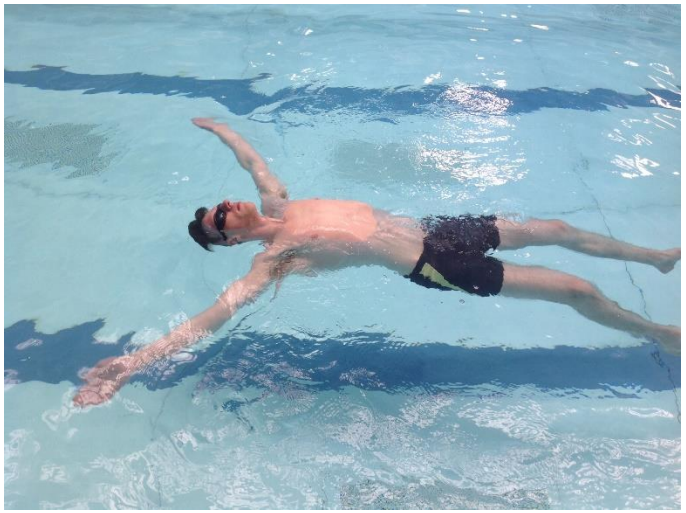
“How to Float”

Adaptations to favour floatation e.g. on the back:-

- Enlarge the body without making it heavier – inflate it – maximum inhalation.
- Get maximum amount of body IN the water – head back etc.
- Alter the distribution of the body round the centre of buoyancy.
  - Lengthen the head end of the lever / stretch arms back in the water behind the head.
  - Shorten the leg end of the lever / bend legs.
- Use weight ‘out of the water’ i.e. the hands, to tip the body further towards the horizontal.

Scottish Swimming

Cont.



Scottish Swimming

Floating Horizontally …. Attempting to Float Horizontally

- **Start vertical …. the KEY point for poor floaters / most floaters.**
- **Make the adjustments mentioned above:-**
  - Enlarge the body by inflating the lungs.
  - Get maximum amount of body in water.
  - Redistribute body weight etc.
- **Let the body float up to its natural level.**
- **Exhale a little at a time / inhale quickly and maximally to sustain floating.**

Scottish Swimming

Resistance

- **The resistance of the water to the body passing through it - Several types …….**
  - **Frontal resistance**
    - Size of area presented in the direction of travel + shape.
  - **Eddy current resistance (tail drag)**
    - Shape that allows flow of water over / off the body.
  - **Wave drag (think 'anti wave lanes')**
  - **Surface friction**
    - Viscosity of water (colder = greater viscosity / FINA and competition i.e. 25 - 28^{o} C pool / Max 31 ^{o}C open water).
    - Body / skin /costume surface / hair / cap.

Scottish Swimming

In Relation to Teaching Non-Swimmers / Early Stage Learners

This primarily means:-

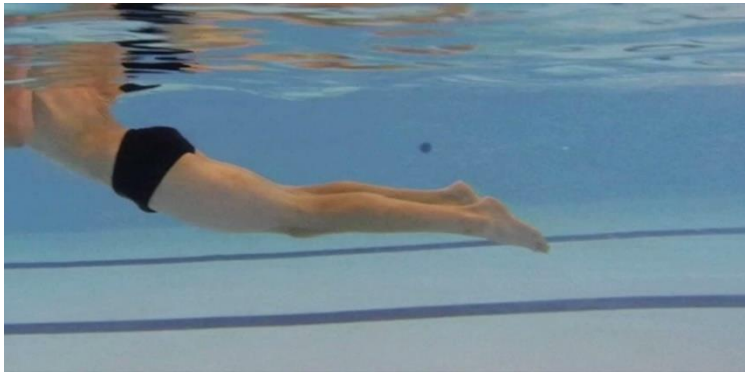
<u>Streamlining</u> i.e. body size and shape (which relate to frontal resistance and eddy currents).

– to be followed up in core aquatic skills.

– to be followed up in all strokes.

Scottish Swimming

Streamlining …… cont.



Scottish Swimming

..... cont.

- **Minimising wave drag** i.e. avoiding creating un-necessary waves at the surface e.g. on hand entry / head position.
- **Minimising viscous drag** i.e. avoid long baggy shorts.

[other aspects such as viscous drag at the elite level i.e. 'costumes' / 'shaving down', water temperature, anti wave lanes etc. relating to competitive swimming / high level competitive swimming can add interest for candidates].

Scottish Swimming

Propulsion

Division of opinion on the propulsion in the strokes during the past 50+ years.

…… science does not always agree ….. opinions change over time ……. science advances …… etc. i.e. our information evolves and we need to keep up to date / and be aware of changing opinions.

This is more so about PROPULSION than any other aspect of our basic principles.

Scottish Swimming

Therefore ……

We are covering the 2 key principles – lift and drag.

Their weighting differs depending whose view you read (Maglischo, Schlihauf, Sanders etc.).

Just be aware there are differing views / all contribute / it is the proportions that differ.

Scottish Swimming

Propulsion

Propulsion is the force that drives the body forwards (or backwards / or upwards / or downwards) through the water.

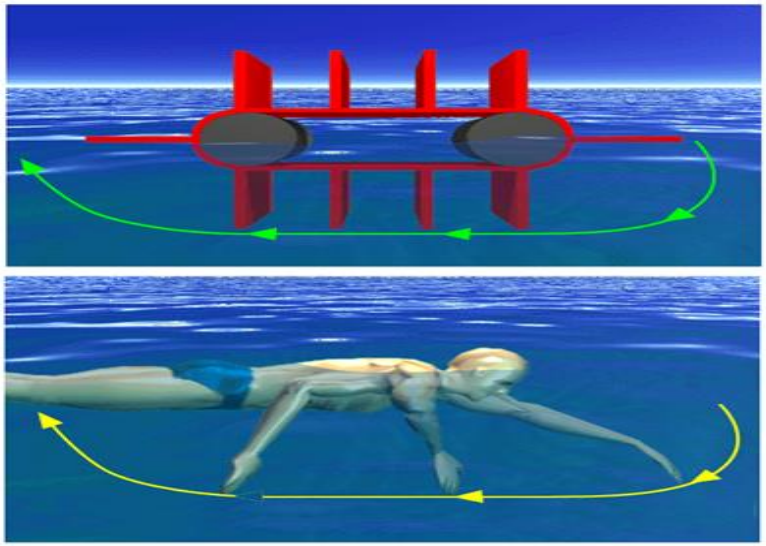
<u>2 forms</u>

- **Paddle type propulsion – Newton's 3rd Law of Motion - drag force.**
- **Propeller type propulsion – Bernoulli's principle – lift force.**

Scottish Swimming

Newton's 3rd Law – Paddle Propulsion

Paddle propulsion e.g. paddle steamer / canoe paddle etc. – producing drag force.



Scottish Swimming

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Newton's 3rd Law of Motion

To every action there is an 'equal' and opposite reaction:-

- Pull back / go forwards.
- Pull to right / go to the left.
- Push down / rise up etc.

Awareness that this is <u>not 'absolute'</u> … water moves ….. absorbs force – relate to sand (which also 'moves').

Scottish Swimming

…. applied to the strokes

- **In the front crawl the pulling back of the hands sends the body forwards.**
- **Adjust the pitch / angle of the hand and the wrist position and keep the**

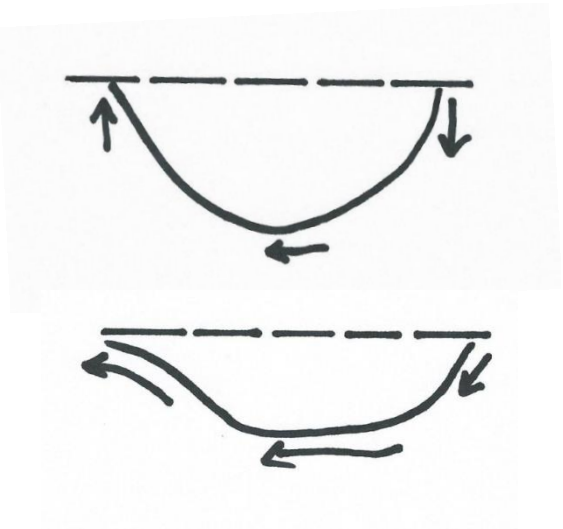
elbow high to ……

<u>maximise the backward</u>

<u>component</u> / minimise the

downward / upward

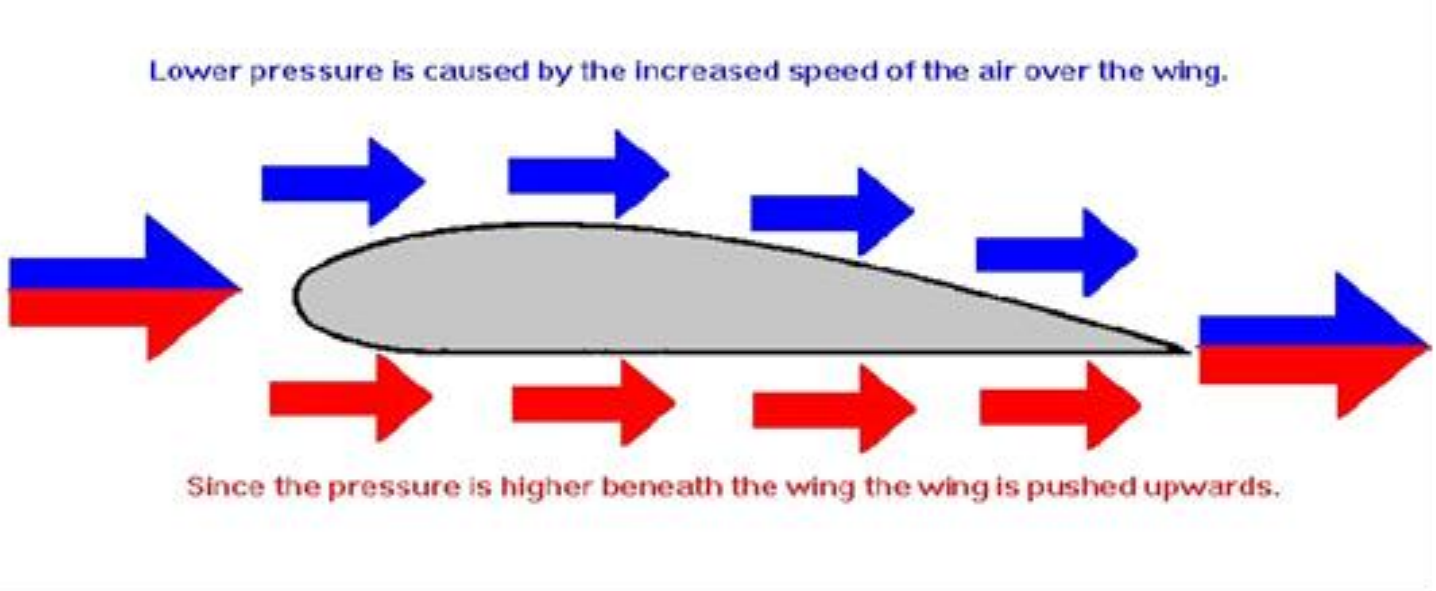
components.



Scottish Swimming

Bernoulli's Principle - Propeller Propulsion

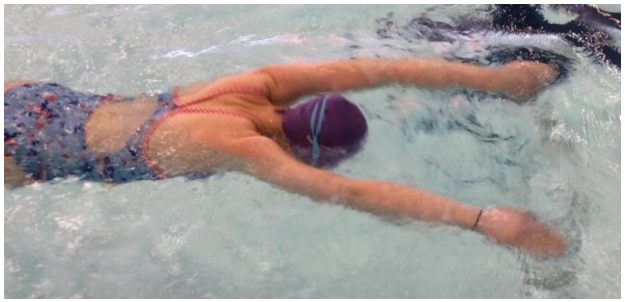
Principle that involves 'lift forces'



Scottish Swimming

…… Cont.

- **Pressure difference between water flow over top and bottom surface of the ‘propeller blade’ (hand) means the lift contributes to propulsion**



- **Blades are at right angles to the direction of travel resulting in :-**
  - ‘forwards’ travel e.g. in the strokes as the hand ‘sculls’ into the catch in Fc.
  - ‘support’ in treading water with the hands flat sculling to produce uplift.

Scottish Swimming

….. applied to swimming

Most easily seen in flat or support sculling:-

- The sculling action (high pressure of the underside of the hand / low pressure above the hand) would raise the hand.
- If the hand is fixed in the water the uplift is transferred to the body i.e. the sculling movement supports the body.

Also applies to the strokes:-

- e.g. in front crawl, the sculling ‘mini sweep’ to the ‘ catch’ would send the hand upwards / forwards (as long as the wrist / elbow are kept ‘high’) thus it contributes to moving the whole body forward.

Scottish Swimming

Frequent questions …..

- **Bent arm**
  - Uses additional muscles groups i.e. elbow muscles as well as shoulder muscles.
  - Enables ‘high elbow and can thus re-position the arm / hand to achieve a preferred angle of applying force.
    - Straight arm – applies force in undesired directions.
    - Straight arm – the muscles do not have the power to apply the force to use the ‘longer lever’.
- **Curved pathway**
  - Applies force over longer time / longer distance.

Scottish Swimming

Tasks

- **Re-read the powerpoints**
- **Read text Cp. 2.1 Mechanics / Fundamentals**

These principles will be referred to throughout the material on strokes and other techniques.

Scottish Swimming