

Sports Diver Theory Lesson – ST3

EQUIPMENT AND TECHNIQUES

Lesson Objectives

The main objective of the lesson is to acquaint students with equipment they will use when extending their range of diving and to discuss techniques, appropriate use and precautions. Practical in-water teaching of SMBs, DSMBs, distance line and compass use supports this theory lesson

Achievement Targets

At the end of this lesson students will:

- Understand use and different types of shot lines
- Understand that surface marker buoys are two distinct types, SMB and DSMB.
- Understand the principles of SMBs and DSMBs, their use and when it is appropriate
- Understand the precautions that need to be taken with both SMBs and DSMBs
- Understand what additional surface marker aids are available for divers
- Understand the principles of distance lines, their use and precautions that need to be taken
- Understand the safety requirements when using lines underwater
- Understand the principles of the diving compass, its use and precautions that need to be taken
- Understand the principles of diving torches and their use
- Understand that whatever equipment is being used it needs to be in good working order and washed and checked following every dive

The following items will be needed:

Examples of: SMB, DSMB, Distance line, compass and torch. Other surface location aid equipment if available

EQUIPMENT AND TECHNIQUES

This lesson covers various items of equipment that will be used by Sports Divers on the different types of diving they may undertake. The lesson will look at equipment, techniques for use, when to use them and precautions that should be taken.

- Shot Lines
- Surface Marker Buoys
- Other Surface Detection Aids
- Distance Lines
- Compass
- Dive Torches

SHOT LINES

Some students may be already be familiar with shot lines, but when diving experience broadens, there are other configurations that they may encounter, particularly when dives include decompression stops.

What is a Shot Line?

- A shot line is a datum that connects a surface marker with the dive site below.
- It is constructed using a large floating object, a buoy or air filled container, to which a line is attached. At the other end of the line, a large 'shot weight' (also known as a "sinker" for obvious reasons) is firmly connected
- On the surface the buoy indicates the area where diving is taking place and underwater the shot is a datum that marks the dive site

Why use a Shot Line?

- It provides the divers with the shortest possible route between the surface and the planned dive site and back again. If carefully placed, the shot line will put divers directly onto the dive site thus avoiding the need to search around for the site and it saves on valuable dive time
- As a 'fixed' datum line, a shot line offers a visible and safer route to the seabed/surface. As it provides a secure, visual reference point on descent or ascent. This is important if deeper diving is being undertaken, if visibility is restricted or if diving with inexperienced divers

If diving in tidal waters, planning the dive during slack water is important for the comfort of all divers. If there is water movement at the beginning or end of slack water, a shot line ensures that divers will have a secure line to hold onto when descending to the dive site or when ascending back to the surface

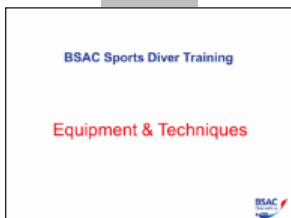
- Also, if dives involve decompression stops, it is more comfortable and safer to carry them out on a secure line
- A shot line marks the entry and exit point of divers. This aids safer dive management and gives the boat cover a clear reference point or area to patrol to protect the divers below

SHOT LINES - DECOMPRESSION

There are a number of shot line configurations that divers will come across when diving. Whether decompression stops are included in the dive plan or not, listening to the Dive Manager's brief and understanding the descent/ascent procedures is important as all the divers in the group need to follow the same 'route'. If coming across different shot line configurations for the first time, it is important to dive with a more experienced buddy to be 'shown the 'ropes' so to speak.

Back up Deco Cylinder

- A clear advantage of shot lines is that in facilitating decompression diving,



a back-up/emergency decompression cylinder can be fastened to the shot line at a 'decompression station'

- However, this should only be used as a back up or emergency system. Divers should carry enough gas to complete their decompression stops according to their dive plan

Lazy Shot Line

This is an extended version of the single line decompression station and introduces a diversion on ascent to a separate decompression station where divers can decompress and ascend in comfort thus avoiding 'diver congestion' on one single line.

- An extra line is attached to the main shot line
- This is connected to the back up cylinder supported by another line and buoy. The line is often weighted to keep it as vertical as possible for the final ascent
- The advantage of this system, particularly in tidal waters, is that the last pair of divers can disconnect the attachment to the main shot line allowing the station to drift with the tide with the cover boat following. This allows for far more comfortable decompression stops as they are unaffected by the current while decompressing - divers are being moved with the tide rather than hanging on to a line against a current

However, there needs to be a 'logging' system if the disconnection is going to take place, as the last pair of divers need to know they are the indeed the last pair to safely disconnect the line

The Dive Manager will establish the diving order of buddy pairs to ensure that the more experienced divers in the group will handle any disconnection of the lines

Another version of the Lazy Shot line is called a **Decompression Trapeze**

- Generally two tubular bars are introduced and placed at 9m and 6m. Disconnecting the trapeze from the main shot line follows the same procedure as the Lazy Shot

There are always variations on a theme and depending on where in the world diving takes place, students may come across similar systems that, in more benign water conditions, may be attached to dive boats to facilitate safety or decompression stops.

If any of the systems are being utilised on a dive:

It requires that all divers must return to the shot at the end of the dive



SURFACE MARKER BUOYS

Surface Marker Buoys are an important safety device for divers as they mark the divers' position.

Surface Marker Buoys fall into two distinct categories

- **A SMB - a surface marker buoy which provides a permanent indication of divers' position throughout the dive**
- **A DSMB, a delayed SMB - which is deployed from underwater by the divers usually to mark their location on ascent**

What is important in considering each type is:

- Methods of deployment
- Their use and precautions that need to be taken

THE SMB

Needs to cater for being connected to the diver throughout all stages of the dive, from leaving to arriving back at the surface.



Consists of:

A highly visible surface float

- Generally, these are inflatable, which makes for easy storage in dive kit bags. When inflated they will be of a size that can be easily seen by surface cover but not be unduly affected by surface wind or currents. They come in various shapes from round to cylindrical and are brightly coloured
- They should support a weight of between 10-20 kg, as it is important that the diver cannot inadvertently pull them underwater, particularly when ascending or using the line to hang from at safety or decompression stops.

Line

The float is connected to the diver using a line and a reel.

- How much line is required?

As a general rule of thumb there should always be more line available than the depth of the planned dive - 1.25 x the dive depth allows for any current or surface wind against the deployed line and buoy. Most SMB reels are supplied to cater for sports diving depth ranges with over 50m of line. This is thin enough for the reel to carry sufficient length and strong enough not to break when being supported by the buoyancy of the float

Reel

- The reel provides not only safe stowage of the line but also enables adjustment the line length for varying depths
- A locking mechanism, or ratchet, allows controlled reeling out of the line on descent, easy adjustment during the dive and controlled reeling in on ascent
- There are various ways divers can manage a reel during a dive. Some prefer to hold the reel handle and attach a small lanyard from it to the wrist to prevent loss of the SMB. Other divers will attach the reel by a clip to their BC so it floats behind them but is still within reach for operation. Whatever method is chosen, if the buoy or line gets snagged it may begin to lift the diver towards the surface, so the reel attachment to the diver must have a quick release mechanism



SMB - DEPLOYMENT

Entry

- Divers enter the water carrying the SMB or it can be passed to them following entry

Descent

- Reeling out needs to be carefully controlled with the rate of descent
- The reel should be held away from the body at arms length to avoid snagging on kit
- The buddy should also ensure they are clear of the line

During the dive

- The line should be kept as taut as possible but not causing a strain on the diver operating the SMB. Wave action can pull on the buoy and line, if this happens, allow a little more line to run out
- The line should be adjusted for depth and, If diving on even seabed/dive site, the reel can be locked off

Ascent

- During ascent the line should be reeled in to prevent loose line getting in the way. Divers will also need to control their buoyancy while doing so



WHEN TO USE A SMB

When position of the divers needs to be known at all times

- SMBs must be used for drift dives. The boat cover must be able to follow the divers at all times to avoid risk of separation of the boat from the divers
- When divers may plan to travel some way from their entry point
- In areas where local regulations require their use
- If significant surface traffic is anticipated. Sites close to (but not in) entrances to harbours, shipping channels etc.

SMBs are not suitable for dives where there are overhead obstructions

- Wrecks are not suitable for SMBs. Metal overhangs could snag or cut the line and many wrecks also have other line or nets that could become entangled in the SMB line
- Diving in gullies or on walls below kelp, coral or other marine life. The line will become entangled with the kelp. Any damage to coral or other marine life must be avoided by divers at all times



SMB - PRECAUTIONS

It seems that fins have a magnetic attraction for lines underwater. When and wherever lines are combined with diving the prime consideration and precautions are:

Avoid entanglement with divers and the environment by:

- Careful and controlled deployment
- Ensuring both divers' positions keep them clear of the line
- Awareness of where the line is at all times during a dive in relation to the divers and surrounding environment

Ensure the reel can be quickly released if necessary

If it gets caught or snagged above the divers, it is far better to let it go and then ascend carefully without the benefit of the SMB. If moving surface traffic should catch the buoy or line, the quick release attachment will disconnect the reel from the diver and prevent them being dragged upwards towards the surface.

If there is a possibility of diver separation - the SMB line can be used as a buddy line

By reeling out additional line for the buddy to take hold of, the divers will remain together

- On a drift dive
- Or if visibility is low or reduces during a dive



DELAYED SMB (DSMB)

A DSMB is a marker buoy that can be inflated underwater

- It is inflated at the end of a dive and released so that it surfaces to mark the position of a pair of ascending divers for the cover boat to monitor them
- Usually they are sausage-shaped so that, because of their height out the water when inflated, they are more visible to the cover boat than a small circular float. This is beneficial because, unlike a SMB which can be monitored throughout the whole dive, the cover boat will not know exactly where the DSMB will surface and hence will need to locate it
- Most DSMBs are about 1m long and have a buoyancy of about 20-25 kg when inflated

Needs for deployment

- A connecting line and reel



WHEN TO USE A DSMB

DSMBs are not replacements for conventional SMBs.

They are used in conditions where a conventional SMB is inappropriate

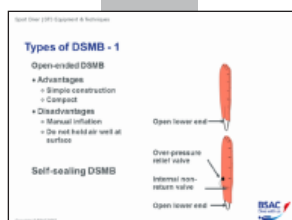
Such conditions are:

- Where there is a high risk of an SMB line snagging during a dive. Wrecks and gullies are the typical example
- Well defined sites marked by a shot line - again wrecks would be a typical example
- Where ascent from a sheltered site would be into a current making ascent up a shot line difficult or uncomfortable. This could occur where the dive site was protected from the current (e.g. in the lee of a wreck or reef) or where the slack water 'window' was such that the current would start to run again during the ascent

DSMBs should not be used when:

- Knowledge of the divers' position at all times during the dive is essential. Such dives would include drift dives and dives on open sites where divers could travel significant distances from their entry point during the course of the dive
- Significant surface traffic is anticipated. Such sites would be close to (but not in) entrances to harbours, shipping channels etc.)

The Dive Manager or Boat Skipper will indicate what marker buoy is appropriate for the dive to be undertaken. They are making their decisions based not just on the dive site but the surface conditions as well. On one day on a particular site the conditions may be suitable for divers to deploy DSMBs at the end of the dive, but the same site on another day with different surface conditions may necessitate the instructions for all divers to return to the shot line or to use SMBs.



TYPES OF DSMB - 1

There are various types of DSMB available to divers

Open-ended DSMB

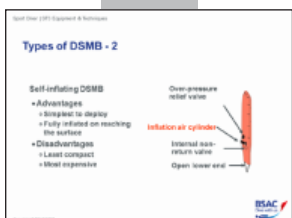
This has the simplest construction and, as its name suggests, it is nothing more than an open-ended tube with attachments at its open end to which a line and reel can be fastened. Gas is injected into the open end, with excess gas - due to expansion on ascent - exhausting the same way. The open end is usually weighted so that on reaching the surface it is held underwater to prevent it tipping over and all the gas escaping.

- **Advantages**
 - It is a very simple construction and therefore is the least expensive
 - When folded up it is very compact and easy to carry
- **Disadvantages**
 - It requires manual inflation
 - It does not hold gas well at the surface

Self-sealing DSMB

This is similar to the open-ended DSMB but has:

- An internal non-return valve comprising two internal flaps in the open end of the tube. These are designed to open to allow gas to enter but are then forced together, sealing the opening, when gas tries to pass in the opposite direction. This arrangement ensures that the buoy remains inflated
- A pressure relief valve, similar to those on dry suits and BCs, vents the excess pressure as the gas expands during the ascent
- **Advantages**
 - They retain gas well at the surface





- **Disadvantages**
 - They are less compact
 - They require manual inflation

TYPES OF DSMB - 2

Self-inflating DSMB

Some self-sealing DSMBs are also fitted with a small gas cylinder and hence become self-inflating DSMBs.

- **Advantages**
 - They are by far the simplest to deploy
 - They are fully inflated on reaching the surface
- **Disadvantages**
 - They are the least compact
 - They are the most expensive

METHODS OF DEPLOYMENT

There are two basic methods of deployment:

Secured deployment

Is used when the buoy is to be released before starting the ascent and where there is a suitable object to which to secure the reel before deploying the DSMB. Once secured, the buoy can be substantially inflated before the reel is unlocked allowing the buoy to ascend. Because of the rate at which a fully inflated buoy will ascend, it should only be sufficiently inflated so that the expanding gas will fully inflate it just before it reaches the surface. Clearly, the shallower the water, the more the buoy will need to be inflated to achieve this. The advantage of this method is that the buoyancy of the DSMB has no effect on the divers own buoyancy

Free deployment

Where there is no suitable object to which the reel can be secured, it will be necessary to hold the reel while also inflating the buoy. In this case, until the DSMB is released, its buoyancy will have an impact on the diver holding it and control of this becomes important. It is also essential to ensure that, prior to inflating the DSMB, there is no loose line that can snag any of the diver's equipment and result in the diver being subject to a rapid and uncontrolled ascent

When deploying the DSMB prior to commencing the ascent is not possible, then free deployment is possible in mid-water. Maintaining a constant depth while deploying a DSMB is a very high workload task for which extremely good buoyancy control and continual practice are essential.

DSMB - USE & PRECAUTIONS - 1

Use of the DSMB commences before the dive

- The line on the reel needs to be checked that is it correctly and neatly coiled. If it is not, it is a potential hazard as it is likely to jam when the DSMB is deployed. If in any doubt reel out all the line and rewind it neatly
- How and where the DSMB and its associated reel are carried needs to be properly thought out. It will need to be where it can be easily accessed when required underwater, and will need to be secured until required so that it is not inadvertently lost. It should not, however, be allowed to dangle as a snag hazard while swimming or to plough a furrow of destruction through all the life on the sea bed

Deploying the DSMB

When ready to deploy the DSMB, irrespective of the method to be used

First ensure that it is totally disconnected from you

If, for any reason, the line jams as the buoy is ascending, you **MUST** be able to instantly release the reel and prevent an uncontrolled ascent

- **Self-inflating DSMB**

They are by far the easiest to deploy and are easily handled by one diver

- **Open-ended/self-sealing DSMB**

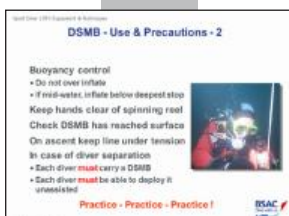
These are inflated by the diver and it is not very sensible to remove the primary regulator to inflate them or to attempt to fill it from exhaust bubbles

- Use the AS mouthpiece. It is essential to ensure that this is kept clear of the attachments to the DSMB to avoid it becoming tangled or trapped and hence dragging the diver up with the buoy

- Inflation can be made simpler if two divers work as a team. One diver can hold the reel while the other inflates the DSMB. This should be preplanned with agreed signals before the dive to avoid any confusion underwater

- **Initial small inflation to straighten DSMB**

For all types of DSMB, initially only a small amount of gas should be introduced in the DSMB to allow it to straighten out from its stowed condition. If the DSMB is not allowed to straighten before it is released, it is possible for the force of the water to prevent the unstraightened portion from inflating. This means that the buoy may only partially inflate during the ascent



DSMB - USE & PRECAUTIONS - 2

Buoyancy control

- Once the buoy is completely straight, add further gas to provide buoyancy. Do not over inflate as the gas will expand on ascent. Where the reel cannot be secured to anything, beware of problems with your own buoyancy control
- Where the DSMB is being deployed mid-water, do so from a couple of metres below the deepest decompression stop to provide a safety margin in case of buoyancy control problems

Keep hands clear of spinning reel

Check DSMB has reached surface

The buoy's ascent may be erratic and not always straight up towards the surface. This affects the line tension and can give a misleading indication that the buoy has reached the surface. If the buoy hasn't reached the surface, attempting to lock the reel could lift the diver upwards. When the line slackens, do not immediately lock off the reel but wait until you are sure that no more line will run out. This will indicate that the buoy has indeed reached the surface and the ascent can be commenced.

Keep line under tension

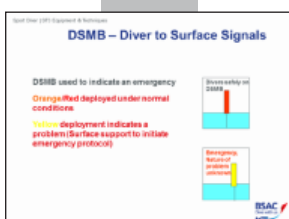
Once the buoy has reached the surface, the line should be kept under tension during the ascent and any decompression stops so that the buoy will be held upright, otherwise it will lie flat on the water surface and be difficult for the surface cover to see.

When planning to use DSMBs, in case of diver separation, it is essential that

- Each diver be equipped with a DSMB
- Each diver is capable of deploying a DSMB unassisted

Practice - Practice - Practice

Like any other skill, deploying a DSMB needs to be constantly practiced if competence is to be retained. Don't leave it until you have to use one to find out whether you are still capable of doing so.



DSMB - DIVER TO SURFACE SIGNALS

DSMBs can be used to indicate an emergency situation where divers carry two DSMBs of different colour. One is used routinely under normal diving practices, the other being deployed to indicate an emergency.

Recognised practice

The recommended practices discussed here should be thoroughly understood by the dive manager and all team members prior to undertaking any dives. This will include all divers and members of the surface party and, where appropriate, the boat skipper.

- Divers should clearly label buoys with the name of their owners.
- To avoid confusion:
 - Using a single DSMB it is recommended that the colour is Orange or Red
 - Using two DSMBs, it is recommended that the Orange/Red buoy is deployed under normal diving conditions, the yellow buoy deployed in an emergency or when assistance is required.

Once a yellow buoy is seen the surface support team can then initiate emergency procedures depending on the nature of the situation. This may require the surface support team to investigate further.

Under suitable conditions deployment procedures and skills in the use of DSMBs should be practiced so as to maintain competency in communicating with the surface.

ADDITIONAL SURFACE AIDS

Using SMBs and DSMBs to mark their position for surface cover, there are some additional items that divers can also use to attract attention if separation from the boat cover occurs.

- **Dive Flags**

These are made up from pieces of tubing that, when folded down, can be attached by bungee cords or large rubber bands down the side of a cylinder. When deployed, the tubes telescope out to form a rigid pole with a flag that can be displayed at some height above the divers. If diving in open water or when there is a swell, the extra height of the flag allows the boat cover to see the divers position on the surface more clearly

- **Strobe Lights**

These are small flashing waterproof lights. They can be switched on both underwater and at the surface but a flashing light on the surface means distress, so they should only be used in an emergency

- **EPIRBS (Emergency Position Indicating Radio Beacons)**

These waterproof units, when activated by the diver, will relay a signal to satellites linked to the Global Maritime Distress and Safety System (GMDSS). These are small versions of EPIRBS used by boats in life threatening situations. For obvious reasons they should only be used if divers are separated from their boat and lost on the surface

Other surface aids include

- **Flares**

These are smaller version of flares carried by all dive boats. Housed in a waterproof container they can be taken on dives and used at the surface in case of distress. However, the integrity of the waterproof housing needs to be checked regularly and also the 'life' of the flares themselves. Being rarely used they are often forgotten until they might be needed

- **Whistles**

Many BCs are sold with a simple whistle to attract attention. Also available





are gas operated whistle units that can be connected to a BC's inflator hose

- **Mirrors**

Small reflecting (non breakable) mirrors can be used to attract attention by reflecting sunlight

DISTANCE LINES

What is a distance line?

It is usually a temporary (horizontal) bottom line that serves as a marker of the shortest route between two points, when return to the starting point is essential

There are a number of applications for distance lines, which include:

- When guaranteed return to shot line is essential
- When the visibility is poor
- When the site to be explored is reasonably compact

Guideline for other divers

A distance line can be laid for other divers as a guideline to a site (but the last pair of divers need to return with the distance line on their return leg)

TYPES OF DISTANCE LINE

In its simplest form it is an SMB line, or heavier line, run out by divers as they explore away from the shot weight (or other reference point).

SMB line & Reel?

- **Advantages**

Almost every diver has or can easily obtain one. They have a clip at the end of the line, usually attached to the buoy, which can be attached to the shot line

- **Disadvantages**

SMB line usually floats rather than sinks and the SMB reel itself may be buoyant. Unless used correctly, slack line can float upward and become an entangled hazard

A dedicated distance line?

Weighted line on a negatively buoyant reel

- **Advantages**

- If the line is weighted it lies on the bottom
- It reduces the risk of entanglement.

- **Disadvantages**

- The reel and line is heavier
- Weighted line is a little thicker than SMB line so the size of the reel required for a given length will be larger

For occasional use, a SMB line and reel work well. If the diver is likely to undertake a significant proportion of deeper wreck dives or dives involving decompression, a dedicated distance line using weighted line is a good investment



DISTANCE LINES - USE

- Attaching the distance line to the shot should be carefully done so that it is secure and will not ride up the shot line.
- Swimming out and back in a perfectly straight line is not normal underwater, as some changes of direction will inevitably occur. Such changes of direction, when using a distance line, can result in the line becoming tangled. It is essential therefore that when a change of direction is made, the line is secured at that point before continuing. This should be

done using some suitable object, which has no sharp edges, and in such a way that it is not likely to become inadvertently detached. It must however, be easily detached on the return leg back to the shot.

The attaching point should be carefully chosen so the line does not damage any encrusting or attached marine life.

- Deploying a horizontal line should be controlled carefully to ensure it is well clear of the divers equipment, particularly the fins. Planning the buddy position is also important to avoid entanglement. If using SMB line, it is important to keep a reasonable tension on the line to prevent it floating upwards.

LINES AND SAFETY

Any line underwater can be a hazard to a diver and must be treated with caution.

- Always carry a sharp knife with a line cutter and a serrated or saw tooth edge. As additional back up, a pair of surgical scissors or a net cutter are a good idea and fit easily in a BC pocket
- Always keep the line as taut as possible, but clear of any snags and sharp edges or wreckage, rocks or coral: they could easily cut the line. It is also important to take great care with lines and coral or other marine life - careless use can cause untold damage
- Deploy lines away from the body, an outstretched arm puts the reel and line at the furthest distance possible from the diver's equipment
- When using distance lines avoid finning too close to the line - remember fins and their magnetic effect on lines
- If several pairs of divers are underwater and deploying distance lines at the same time, there is scope for much entanglement. If necessary, later pairs should clip/route their own distance line under previous lines
- Do not use the same reel for both distance and SMB lines. If it becomes tangled or cut while being used as a distance line, you are then left without a DSMB line
- If gas consumption, dive time or any problems preclude returning to the shot line when using a distance line, cut the line (line is cheap) and ascend using a DSMB



THE DIVING COMPASS

Another item of equipment that used correctly can return a diver to their point of entry is a compass

Use for

- Navigating underwater to a specific area and return back to the starting point - this could be from an anchored boat or the shore
- The compass can also be used to indicate general direction, for example the shore line is to the north of the dive site, deeper water is to the south
- It can be combined with underwater pilotage

The compass consists of:

- A magnetic needle that seeks magnetic North
- The needle and its compass card are housed in an oil filled waterproof case. The oil dampens, slows down, the swinging movement of the needle and card
- There is usually a direction-of-travel arrow on the casing
- To allow for swimming on a predetermined heading, most compasses have a rotating bezel around the outside of the casing which is graduated from 0 to 360 degrees
- There is often a cursor on the transparent window of the compass so that if the compass needle is kept within the limits of the cursor line, the



direction of travel can be predetermined

NAVIGATION TO AND FROM A SITE

The following is a simple description of using a compass to travel to and from a site - (students will be practising with the compass on dry land and then underwater during a practical session and this caters for the different types of diving compass that can be used)



Setting the direction

- A compass bearing is taken on the surface towards the site
- The compass needs to be aligned to the point of interest along the direction of travel arrow. The bearing is set using the rotating bezel to align the cursors with the point of the north-seeking needle

Underwater - the journey out

- The needle needs to be kept within the cursors while the diver's body is aligned with the direction-of-travel arrow for the swim
- Measuring the distance to the site can either be by timing the swim or counting fin strokes

The Reciprocal bearing - the return journey

- For the return journey, the reverse (the reciprocal or 180 degree difference) needs to be followed to return the divers to their entry point. The reciprocal is set by the diver turning and aligning the bezel index marks with tail of north-seeking needle
- Timing the swim, or counting the same number of fin strokes as on the way out, should return the diver to their approximate start point

COMPASS - USE & PRECAUTIONS

From the practical session students will learn that some precautions need to be taken when using a compass.

Use

- The compass needs to be held level with the direction of travel aligned with the centre line of the diver's body
- Finning when there is a current will gradually drift the diver off their predetermined course over the seabed even though the compass bearing is being followed. If divers experience a current, keeping the bearing but finning at an angle across the current should compensate for its drifting effect

Sources of error

- Magnetic influences will affect the north seeking magnetic needle
 - Wrecks are generally large lumps of metal and their magnetic effect will interfere with the compass - just putting a dive knife next to a compass will cause the needle to move away from a pre-set bearing
 - Any other ferrous metal near the compass will do the same, e.g. a buddy's cylinder. The buddy should ensure they remain at the side of the diver using the compass and not move ahead of them

- **Disbelief**

Another source of error is the diver disbelieving that the compass is correct. Finning without any other visual reference points or in low visibility is when a diver needs to trust their compass

Precautions - fixation

- **Fixation**

If using a compass in reasonable visibility or combined with pilotage, divers should not only check the bearing that they are travelling on, but also look up from the compass to check their surroundings and look



ahead. Also, divers still need to remember to monitor depth, time, gas and their buddy

DIVING TORCHES

Divers use torches to

- **Illuminate the dive area**

A torch will be needed if light or visibility levels are reduced on a dive but, even in good conditions, a torch will enable the diver to see inside confined spaces such as crevices in rocks or holes in wrecks. Torches are obviously essential on night dives as they are the only source of good underwater illumination

- **Highlight colours and light up points of interest**

Even in daylight, the torchlight compensates for the loss of colour filtered out by water, the deeper a diver goes

Many Types

There are many types, shapes and sizes of diving torch, from small pin beam torches that light a small area, to large lamps with wide beams that flood over a larger area. Many divers carry two torches, their main torch with a good beam range and a small pocket torch as a back up should the main torch fail.

- It is obvious that a diving torch should be waterproof, but those sold as diving torches have also been pressure tested, often to depths way beyond the operating depths of sport diving
- They need to be robust to cope with the diving environment both while underwater and while on the surface (in dive bags or on boats)
- Torches either use replaceable batteries or a rechargeable battery pack. They need to be checked before every dive to ensure that they are working

Care

The weakest areas of diving torches are the bulbs and 'O' ring seals. Bulbs need replacing from time to time and, if changing a bulb, disposable batteries or having to recharge the battery pack, the torch casing needs to be undone. The case is sealed by an 'O' ring and this needs to be checked thoroughly to ensure it is clean and in place when putting the torch back together. The smallest item of dirt, sand, grit or even a hair, can break the 'O' ring seal when water will enter and flood the torch. Some torches have overcome this problem by having external charging points for a rechargeable torch, which avoids having to open the casing up to recharge the batteries

- As with all other diving equipment, torches should be washed after every dive

Torches and Safety

- A buddy's torch beam in low light or visibility levels, but especially on a night dive, is a good "marker" of the diver's position. Controlling the beam is important - do not shine it directly into the buddy's face, it will cause a temporary 'blindness'. The benefit of carrying a torch becomes apparent when indicating areas of interest and illuminating equipment or signals .

SUMMARY

This lesson has looked at equipment that will be used by Sports Divers on the different types of diving they may undertake. This included techniques when using and considerations on safety precautions to take where applicable:

- Shot lines
- SMBs and DSMBs
- Other Surface Detection Aids
- Distance Lines



- Compass
- Dive Torches

Divers should ensure that all equipment

- Is kept in good working order
- Is washed and checked after each dive

And, as with any item of equipment

Practice, Practice, Practice

It is *essential* to become familiar with, and maintain proficiency in, its operation and successful use