1 Introduction

The Crawley Branch of the British Sub-Aqua Club is a registered branch of the British Sub-Aqua Club (BSAC). All training and diving within CRABBSAC adheres to the BSAC Safe Diving Practices and other recommendations. More information on these can be found by contacting BSAC directly. Additional rules are observed by CRABBSAC members.

Accidents can and do occur in club and society activities. However, we all have a duty to run activities in a way that minimises the likelihood and severity of the incidents. If you organise an activity or event you are responsible for it. Even if you get someone else to run it, you need to check that they can do it safely. Committees have a duty of care to everyone who could be affected by their activities and events. This means taking steps to prevent foreseeable harm.

The aim of this document is to give you an insight into the principles of Safety Management and to introduce Risk Assessment, and how it can be used within the club environment.

1.1 Successful Health and Safety Management.

For any Club to be successful in its operations, it must manage its resources efficiently to provide the products or services required. These resources include students, instructors, the plant and equipment, and the activity and/or practice areas.

There are three main reasons for being concerned with safety, health and welfare.

First, and from a legal point of view, there is a need to comply with the health and safety legislation laid down by the United Kingdom Parliament and the European Parliament in so much as it applies to the Club.

Secondly, the moral issue of ensuring that those persons for whom we are responsible, be they students, instructors, spectators or members of the public, leave our care at the end of the practice or session, in the same state of health and with the same number of limbs as they started out with. For example, members need to know that the Club has a good health and safety record and a positive safety framework and culture in place.

Finally, but hardly least, there is the financial consideration. Accidents and ill health cost money. Resources should not be wasted or lost due to a poor safety performance and, of course, negligence can lead to financial claims in the event of successful litigation.

Some simple rules for compiling risk assessments which work are captured in the following acronym:

C	Clarify the Hazards and Risks
R	Re-assess and revise it where necessary
I	Involve all participants in the process
S	State it simply in writing
I	If it’s to risky - don’t do it!
S	Share the knowledge and experience

2 Safety Management Systems

A proactive Safety Management System would encompass the following elements:-

- Policy
- Organisation
- Planning & Implementation
- Performance Measures
- Performance Review

There must be an organisational desire, expressed as a **Policy**, to operate in a safe manner.

Within the **Organisation**, responsibility for safety matters must be assigned and acknowledged.

The **Planning and Implementation** stage of the Safety Management System is where risk assessment comes in, to ensure that a systematic approach to the identification of risks and the allocation of resources to control them is adopted.

Use of appropriate **Performance Measures** such as the number of accidents or near-misses, enables regular active and reactive monitoring, a check on progress can be carried out and amendments and changes made to correct faults. This will involve inspections of premises, checking accident records and near misses (especially) and undertaking environmental monitoring.

Performance Review takes the monitoring one step on and can include external or independent audits of the safety system. These can be used as a benchmark with other Clubs if appropriate. The aim is to ensure that remedial action is taken, to deal with specific health and safety issues arising from the measurement of performance and to check the overall performance of the system.

3 Risk Assessment

This is a tool that can be used to help manage performance safely. The assessment of sporting activities must take into account:

- the capabilities and limitations of the students
- the safety and maintenance of equipment being used
- the environment in which the activity is being undertaken
- the inherent hazards in these activities.

Risk assessment can be defined as *the systematic identification of the hazards present in a Club environment and the estimation of the magnitude of risks to the health and safety of the participants*.

To work successfully, risk assessment is a five-step process:-

1. identification of all hazards in the area under review
2. identification of those persons at risk
3. evaluation of all risks associated with the hazards
4. implementation of controls, if necessary and
5. recording of significant aspects of the assessment and regular review

The purpose is therefore to decide and implement the control measures necessary to ensure a safe and healthy environment, but risk assessment is only the starting point.

Risk assessments are not just a one-off exercise. They should be carried out before the activity is first undertaken and then reviewed regularly and when anything significant changes that substantially affects the method of operation. If a serious accident or near miss occurs, then a review of the assessment must be undertaken as part of the accident/near miss investigation.

3.1 Hazard and Risk

Before risk assessment is explained in more detail, the terms *hazard* and *risk* need to be defined:

Hazard - the potential for harm

> For example: in a climbing environment, abseiling down a cliff. The student could fall and be killed. Clearly, the hazard is falling off the cliff to the ground

Risk - the likelihood of that harm occurring and the severity of its outcome.

> Using the same scenario, if the student is abseiling without a proper safety harness and not properly top-roped by a competent person, the likelihood of falling could be high. The severity of the outcome would depend on the height of the fall. A fall from a low level could be painful, but a fall from the top of the cliff or indoor wall could be fatal, possibly even to other people standing below. The extent of the risk should also take into account the number of other people exposed to the harm. Is only the abseiler at risk or is there a group watching below?

3.2 The Risk Assessment Process

A preliminary to the risk assessment process, is to decide the area to be covered. This may be one activity, such as open water diving, or it might be a particular area, e.g. a swimming pool. Once the venue/area has been decided, then the process of assessment must start. It must also be remembered that non-routine activities such as breakdowns and maintenance must also be assessed.

So who should undertake risk assessments?

Where there are activities with low risks, then an individual instructor could undertake the risk assessment after proper training. But often, using a team approach is better. It must be remembered that risk assessment is a management tool and that 'those responsible', i.e. Club officials, should be leading the team. It is preferable to have a small team that should include trained personnel for the area, i.e. those who know, in detail, what the task is or what happens in the activity area. The members of the team should be competent to undertake the assessment, and they may require training in assessments before doing so.

3.2.1 Identification of all hazards in the area under review

Identify the potential hazards to the participants from the activities being carried out and from the environment in which they will be carried out. Some hazards (e.g. rapid ascent) will be common to all environments from swimming pools to hard boat dives in the open sea. Others will be very specific to the particular location or activity.

Identify only significant hazards. Including those of a trivial nature only makes the process unwieldy and detracts from the identification of those that are significant.

This can be carried out as a table top exercise, or better still, by an inspection of the area or activity. The problem with table top assessments is that how you think an activity is carried out, might be very different in reality. A thorough walk through the area under assessment with careful informed observation of what is happening during an activity session is vital, to ensure than an accurate picture of what really goes on is obtained.

Hazards can be grouped into families. The groupings may not be perfect because there is an element of overlapping, but they can enable the task of hazard listing, to proceed quickly and systematically.

- **Physical hazards**: activity areas, sites, locations, include gravity, hot or cold temperatures, travel format, movement, and would involve manual handling, equipment, vehicles, electricity, noise, vibration, loss of navigation aids, loss of power or equipment failures and obsolescence of equipment

- **Chemical hazards**: fire, explosions, contamination from substances at work.

- **Biological hazards**: animals, humans, plants and micro-organisms.

- **Natural phenomena**: heat, light, water, weather, currents, storms, shallow waters, etc.

Hazard identification can be performed by using the following approaches:

- reviewing past accident history from other areas where situations are similar, and especially by reviewing the BSAC annual incident reports;
- brainstorming by a team of experts that understand the situation under consideration; and
- consultation with members, many of whom may have relevant knowledge or expertise.

The list of hazards should be shown or discussed with all interested parties to ensure that all hazards have been included.

3.2.2 Identification of those persons at risk

Many hazards will apply to all divers, whereas some will be more appropriate to particular groups such as trainees.

The risk assessment must include the hazards to all people who may be affected by the activity under consideration. A list of people and numbers affected needs to be drawn up, such as

- Bystanders
- Instructors
- Members,
- Other participants
- People with disabilities.
- People with medical conditions
- Students
- The General Public,
- Young People

3.2.3 Evaluation of all risks associated with the hazards

Consequences

Generally, the four types of hazards can generate several different types of adverse consequences:

- health problems or death and injury, sometimes referred to as mortality (death) and morbidity (injury);
- property losses including losses of real or tangible property (buildings, vessels etc.);
- net-income losses are any losses that lead to an increase in costs or a reduction in revenues;
- a liability loss results when an individual or organisation is sued for an alleged breach of legal duty, regardless of the merit of the suit. The party sued must defend itself, even if it has done no wrong;
- a personnel loss results when an organization loses the services of a key member. The loss may simply result from lost productivity until the new member is properly trained;
- environmental losses (negative impact on water, flora or fauna caused by pollution); or
- a loss of reputation or status.

There are many ways in which the evaluation of risks can be determined. These range from the numerically complicated systems to a simple subjective judgement of low, medium or high risk. For most activities and within a Club environment, a simple method involving a degree of subjectivity should suffice and an example of such a system follows.

It is based on the generation of a ***Risk Factor Number*** from an assessment of the likelihood (probability) and severity of injuries arising from a hazard.

Establish a frequency or ***Likelihood*** rating based on the scale shown.

1. **Not Likely.** There is really no likelihood of an accident occurring. Only under freak conditions could there be a possibility of an accident or illness. All reasonable precautions have been taken so far as is reasonably practicable. This should be the normal state of the workplace.
2. **Possible.** If other factors were present, this incident or illness might occur, but the probability is low and the risk is minimal (e.g. storage of heavy items above head height, worn steps, etc.)
3. **Quite Possible.** The accident may happen if additional factors precipitate it, but it unlikely to happen without them. The additional factor is more than a casual slip or nudge. (e.g. leaving the engine running, obstructing an aisle, failing to replace a defective light in a storage area, etc.)
4. **Likely.** The effects of vibration, wind or human carelessness could precipitate an accident, but which is unlikely to happen without this additional factor (e.g. climbing ropes not belayed, puddle of water on gym floor, electrical cable in walkway, etc.)
5. **Very Likely**. If the work continues as it is, there is almost a 100% certainty that an accident will happen at least once (e.g. from broken stairs, exposed electrical conductors, unsupervised use of trampolines, etc.)

Now establish a ***Severity*** rating for the identified hazards using the following scale:

1. **Nil**. No risk of injury or disease
2. **Slight**. Causing minor injury that would allow the individual to continue after first aid treatment
3. **Moderate**. Causing injury or disease could keep an individual away from work for more than three days
4. **High.** Causing death or serious injury to an individual. Serious injury includes fractures, amputations and hospitalisation for more than 24 hours

5. **Very High**. Causing multiple deaths and/or widespread destruction

From these tables you can compile a ***Risk Factor Number*** by multiplying the Likelihood rating by the Severity rating. A number between 1 and 25 would result. Such a rating enables the most serious risks to be considered first, i.e. the higher the number the higher the risk.

	Likelihood				
Severity	**5**	**4**	**3**	**2**	**1**
5	25	20	15	10	5
4	20	16	12	8	4
3	15	12	9	6	3
2	10	8	6	4	2
1	5	4	3	2	1

We can also classify the Risk Factor Number

- 16 – 25 ***Extreme*** Risk level unacceptable.
- 10 – 16 ***High*** Undesirable.
- 07 – 10 ***Medium*** May be acceptable.
- 01 – 06 ***Low*** May be acceptable.

Different Organisations will use different groups of numbers to decide whether action is urgent, whether it can be planned over a short period, or indeed whether it can be left as it is, i.e. by accepting the risk.

3.2.4 Implementation of controls, if necessary

What precautions and risk control systems do you currently have in place?

- Are you aiming to control the risk with the law, best practice, and your own standards including things such as training, warning signs, safety equipment, kit maintenance.
- What level of risk do the hazards still present with these precautions in place?
- Is this level of risk acceptable to all who can be affected.
- If not, what further precautions can you employ to reduce the risk?

Having evaluated the risks and identified the priorities, the selection and implementation of the control measures is a fundamental part of the risk assessment process. Here the whole process can be totally negated if the wrong control measures are taken.

Commonly there may be more than one option for control and so a decision must be taken on grounds of effectiveness and cost. Over the years a list of controls has been developed, i.e.

- safe system of operation to reduce the risk to an acceptable level with written procedures that are known and followed (rules / checklists / instructions / manuals).
- elimination, removing the hazard e.g. for summer climbers, maybe no winter climbing trips in Scotland.
- supply of personal protective equipment, (helmets, life jackets, etc.)
- proper training (in safe methods).
- adequate supervision (competent instructors and dive marshals).

- information and instruction (demonstrations and leaflets).
- substitution with something less hazardous e.g. (use of lakes instead of the sea, etc.).
- enclosure, guarding or segregation (pool lane ropes, propeller guards, etc.).

No hierarchy is intended and often the controls will be used in combination so as to ensure that the risk is reduced to an acceptable level. It must be remembered that such controls are only as good as the standard of supervision implementing and monitoring their effectiveness.

3.2.5 Recording of significant aspects of the assessment

To be effective risk assessments need to be recorded. This can be done on paper, or (preferably) on a computer. There are many such computer-based risk assessment packages available. Taking the activities one by one, the recorded assessment should include the significant facts, e.g. the hazards and risks identified, those who would be at risk, the probability and forseeability of harm, relevant controls, action required, review dates, etc.

By having records it will be easy to refer to the risk assessment when it is time to review it, or when it needs to be examined by others in the light of an accident or near miss occurrence. Also, it is an important record that can be given to other members to enable them to undertake the activity safely.

3.3 Monitoring and Review

Risks may change with time. For some risks such changes may be very infrequent, while for others they will vary with each location or occurrence.

For instance, risks involved in training in a swimming pool may only vary when either the type of training to be carried out is varied or the swimming pool environment itself is subject to change. Once prepared, a risk assessment for such a venue will remain valid for a considerable period.

Where diving is carried out in sheltered water or open sea conditions, some aspect relevant to the diving activities may not change, while other aspects relevant to the site conditions may change on each occasion. For such a location a risk assessment can be prepared which will cover many of the risks which remain constant, only those risks which vary (e.g. Weather, underwater visibility or specific activity dependants) needing to be addressed specifically.

As has been explained earlier, the actual risk assessments are only the start of the process. Once the control measures have been implemented, there must be a programme of checking. This can take the form of inspections and audits, reports to committees or safety meetings, accident and ill-health record monitoring, etc. There must also be a regular check as to whether anything significant has occurred which would change the risk assessment.

3.4 Generic and Specific Risk Assessments

Many risks may therefore be ***'generic'***, while others are more ***'specific'*** depending upon the diving activity or location.

The risk assessment should, however, be **reviewed on each occasion and throughout the day** to ensure that the risks identified are still valid. Any changes should be noted, signed and dated to show the changing situation has been assessed, that no further risks have arisen and that the appropriate controls are in place.

This means that where a generic assessment has been produced e.g. for Sea Diving, it must be checked against the actual activity scenario for that specific activity on that specific day to ensure that other hazards have not been introduced.

For example, it is sensible to produce a basic generic assessment for Sea Diving, but where that activity takes place in a significantly different environment, (temperature, currents, depths, shipping lanes) or with different age groups, then a further specific assessment will need to be undertaken.

3.5 Conclusions

A properly constructed and effectively operated Safety Management System with proactive management supported by competent advisers, instructors and safety practitioners, will ensure that sport, recreation and physical education can be provided in a safe and healthy environment. The proper use of risk assessments will enable 'those responsible' to comply with health and safety legislation and, perhaps more importantly, the moral and financial requirements for a safety framework and its implementation within a safer environment.

Risk assessment is in fact already inherent in the way in which individual divers go about organising their training and diving. For example, for open water diving, Dive Planning and Marshalling includes many activities, which are designed to assess and control risk

4 Rules and Recommendations

We have previously seen that rules and recommendations form an integral part of the risk reduction strategy. To illustrate this, some more important common ones in the diving environment are:

- Does the instructor hold an appropriate instructional?
- Does the members hold current BSAC membership?
- Does the members hold current fitness to dive medical or self declaration?
- Are the recommended instructor/pupil ratios observed?
- Does the club have a written set of rules requiring compliance with basic safety procedures?
- Do all students follow an established training schedule?
- Is all club equipment maintained in good condition?
- Is all club equipment clearly identified?
- Is all club equipment regularly inspected and serviced?
- Are the inspections recorded?
- Does all equipment meet BSI or European safety specifications?
- Are all training sessions under the supervision of an appropriately qualified instructor?
- Is diving with an Aqualung in open water prohibited unless an appropriate level of competence has been reached as a result of initial pool training?
- Is an Expedition Leader appointed to be in charge of each diving expedition?
- Is a buoyancy aid always worn when diving with an aqualung on a club expedition?
- Is a knife and snorkel carried by all divers?
- Is the weight belt fitted with a quick release device?
- Does each group member have appropriate protective clothes and enough food and drink?
- Is a first aid kit available at the dive site?
- Is an approved oxygen kit available at the dive site?
- Is a radio/telephone carried or within easy reach?
- Are there people competent in the use of first aid, oxygen and radio present?
- Is the Diving Flag (Flag A) flown from the boat while the dive is in progress?
- Does each aqualung group use a surface marker buoy when diving in open water?
- In open water is a support boat present or shore cover available?
- Is the skipper of the boat used by divers suitably qualified

5 Risk Assessment Specifics

In the planning stages for any dive or underwater activity, it is important that potential hazards are identified and their associated risks assessed. Once the assessment of the risks has been made, suitable measures to control and minimise those risks should be implemented.

The following gives a guideline for areas, which should be assessed prior to undertaking any Dive, Snorkel and /or Boating operation. The following lists provide some of the factors that ought to be considered when performing a risk assessment.

The Divers / Snorkellers

- Experience
- Training
- Skill level
- Pre Dive Fitness level
- Task loading
- Peer Group Pressure
- Mental or Physical Stress

Hyperbaric / physiological factors

- Decompression situation (nitrogen loading)
- Frequency of dives
- Multiple ascents
- Repetitive & multi day diving
- Decompression illness – predisposing factors, depth & duration of dives
- Physical exertion required to conduct the dive
- Noise
- Breathing gas
- Altitude exposure

Environmental conditions and location factors

- Wind strength and direction
- Sea state
- Current & tide
- Visibility
- Entrapment hazards
- Entanglements
- Depth
- Water temperature
- Air temperature
- Strength of the sun
- Wind chill
- Atmospheric conditions, humidity,
- Time of the day
- Underwater terrain
- Contaminants
- Isolation of dive site
- Emergency response delays

Task related factors

- The complexity of the dive task
- Task loading
- Additional equipment problems i.e. use of ropes and lines, tools, nets,

Additional hazards

- Boat handling
- Manual handling
- Dangerous marine animals
- Boat traffic
- Water intakes
- Use of hazardous substances

5.1 Mandatory Control Measures

5.1.1 Diver Training

All divers must dive within the limits set by their training agency, its rules, recommendations and safe diving practices.

5.1.2 Environmental conditions:

The planning for all dives shall take into account any hazards associated with environmental conditions. Wind speed and direction can interact with tides and local currents to create conditions at the dive site that require much greater caution than when conditions are optimal. These changes can occur very quickly and must be monitored very closely especially while at sea and when divers are down.

5.2 Other Hazards:

Other hazards to be taken into account during dive planning are:

(a) Underwater terrain (assessment of entrapment risks, vertical ascent restrictions, unusual water movements associated with underwater topography, visibility restrictions due to sediments);

(b) Location of dive site; proximity to reef edge or shipping channels, exposure to prevailing winds, local effects of tidal changes during a dive. Distance to emergency assistance

(c) Nature of dive task; complexity of task, use of hazardous chemicals or underwater tools, exertion required to complete the task, depth and/or duration of dive

(d) Local shipping movements: numerous boats may move about the area and a constant watch must be maintained by personnel on the surface when diving operations are being conducted.

(e) Dangerous marine organisms: consult with Dive Supervisor for current information

6 Definitions

Adverse consequence: The most likely thing to result from an encounter between something of value and a hazard.

Defence: A physical or administrative measure to limit, reduce, or prevent an adverse consequence.

Hazard - a source of potential harm, or a situation with a potential for causing harm, in terms of human injury, damage to health, property, the environment, and other things of value, or some combination of these.

Hazard identification - the process of recognizing that a hazard exists and defining its characteristics.

Loss - an injury or damage to health, property, the environment, or something else of value.

Residual risk - the risk remaining after all risk control strategies have been applied.

Risk - the chance of injury or loss as defined as a measure of the probability and severity of an adverse effect to health, property, the environment, or other things of value.

Risk analysis - the systematic use of information to identify hazards and to estimate the chance for, and severity of, injury or loss to individuals or populations, property, the environment, or other things of value.

Risk assessment - the overall process of risk analysis and risk evaluation.

Risk control option - an action intended to reduce the frequency and/or severity of injury or loss, including a decision not to pursue the activity.

Risk control strategy - a program which may include the application of several risk control options.

Risk estimation - the activity of estimating the frequency or probability and consequence of risk scenarios, including a consideration of the uncertainty of the estimates.

Risk evaluation - the process by which risks are examined in terms of costs and benefits, and evaluated in terms of acceptability of risk considering the needs, issues, and concerns of stakeholders.

Risk level: An estimate of the probability that a hazard will involve an adverse consequence and of the severity of that adverse consequence.