A review of the water safety arrangements within the sport of rowing

Report on research by the
Royal Society for the Prevention of Accidents

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Executive Summary

Rowing is one of our most successful Olympic sports. Although there is a growing recreational aspect, rowing is a competitive sport where almost all activity occurs within the club structure. Therefore, via club affiliation most rowers are members of the governing body, and as such, are subject to its influence. This is in contrast to other water sports such as canoeing and sailing where membership of the governing body is small compared to the overall numbers who participate in the activity.

This situation affords the ARA distinct advantages in governance of the sport. Equally so, this creates a dilemma for those seeking to manage the risks associated with the sport, in short, *how far can a governing body exercise actual control over members' actions, in what by its nature is a voluntary act and system?* Rowing is overwhelmingly volunteer led, much to the credit of the ARA. Implementing guidance and rules depends almost exclusively upon the cooperation of the clubs, and individuals, with the mutual understanding that this approach is considered to be in the best interests of the whole rowing community. Resolving contentious issues, or exerting change within this framework is very difficult.

When considering available incident data, it becomes apparent that there are very few fatalities associated with the sport; no more than two in the last 20 years and six since the war. This is significantly lower than other water sports. Rowing is largely a competitive athletic event that happens to occur on water and is not inherently concerned with battling the conditions of weather and water, but is purely at risk from the vagaries of weather and water conditions. These fatal accidents occurred during club training sessions as opposed to organised competitive events, which influenced our decision to focus more on the recreational and training aspect of the sport rather than pure competition based activity.

The nature of the challenge and the very low level of fatal accidents suggest that rowing is a relatively safe water sport. It can be argued those involved are unlikely to be involved in serious and life threatening incidents. However the vulnerability of rowers once they end up in the water as a result of a collision, sinking, capsize or swamping means there will always remain the potential for serious harm.

In light of these considerations and some recent near miss incidents, which had the potential for serious harm to have occurred, we have undertaken a review of the safety management regime, attitudes to, and awareness of safety within the sport of rowing. Following discussions with key stakeholders, (identified by Sport England) the terms of reference were expanded to include specific issues such as the effectiveness of guidance produced by the ARA, boat buoyancy, hypothermia and coastal rowing.

Following observation of club activity, interviews with those challenged with controlling the risk management systems within the sport, a systematic review of key documentation, policy and procedure this report provides a list of recommendations that can be taken forward by the ARA and the wider rowing community to improve aspects of safety and risk management. In particular we recommend that:

Systems and Guidance

- That the role of ensuring safety within rowing continues to be developed using sound risk management principles. In particular that the guidance given is evidence based, includes a clear element of cooperation and consultation, and if appropriate is clearly enforceable.

- Emphasis needs to be given to devolving the responsibility for risk management wider among the key players. In effect the responsibility (and action) needs to become accepted as a collective function within the sport, not singled out as a specific function for only a few identified roles involved with the sport.

- That the ARA reviews its current club safety auditing system and considers the practicalities and advantages gained by the approach of other voluntary sports governing bodies systems. In particular the use to some extent of externally sampled (to the club) auditing should be considered.

- That the information and guidance contained in the ARA Water Safety Code is presented in a more targeted manner. In particular the guidance within is given with minimum performance standards and appropriate desirable levels, and is targeted to the particular roles.

People

- That a number of the key roles and responsibilities within the safety system are re-examined, with a view to enabling a better focus on agreed core activities.

- Concurrent to this, a timetabled programme of capacity building among the regional advisors, club advisors and potentially coaching development officers should be considered. The aim of this is to raise the ability of each of these groups to offer support, and engender a clearer understanding of risk management principles and practice.

Equipment

- The ARA should strongly consider a policy that all boats shall be buoyant, that they should have internal buoyancy and have an agreed policy for retrofit of existing boats *or develop a clear, objective system* of dispensation for non-buoyant boats.

- The ARA, together with manufacturers, should develop a test of the swamped flotation of competition rowing fours and eights.

- That the ARA considers the implementation over a time period of five years as a timescale for when all boats should meet a new buoyancy standard.

- The ARA and the wider rowing community should encourage the setting up of a trade association for rowing boat and equipment manufacturers, suppliers and import industry to enable better engagement with standard and legislation development bodies. However the absence of trade association should not be a barrier to the adoption of these recommendations.

- That this report be made publicly accessible.

These recommendations have often been championed by majority, and sometimes all of those that we have spoken to within the sport. We believe the benefit from adoption will be significant in improving safety within the sport. The impact of implementation in terms of cost and disruption should be minimal and acceptable to the majority of rowers.

We have found that those involved in the running of the sport of rowing have been open, enthusiastic and supportive of our work. We are grateful to them for their time and their contributions to the review.

Report from the Royal Society for the Prevention of Accidents

To review the safety of the sport of rowing for the Department of Culture, Media and Sport

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- Jane Blockley
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- Trevor Cave
- Jim Watson
- James Stevens
- Neil Jackson

List of Images

Abbreviations

AALA	-	Adventurous Activity Licensing Authority
AALR	-	Adventurous Activity Licensing Regulations
ARA	-	Amateur Rowing Association
BCU	-	British Canoe Union
BDA	-	British Dragon Boat Association
BMF	-	British Marine Federation
BSAC	-	British Sub Aqua Club
BSI	-	British Standards Institute
BUSA	-	British University Sports Association
CARA	-	Coastal Amateur Rowing Association
CEN	-	European Committee for Standardisation (Central European Norm)
DCMS	-	Department of Culture, Media and Sport
DTI	-	Department of Trade
EBA	-	European Boating Association
FISA	-	International Rowing Federation
IMO	-	International Maritime Organisation
ISO	-	International Standards Organisation
MCA	-	Maritime Coastguard Agency
NWSF	-	National Water Safety Forum
PFD	-	Personal floatation device
PLA		Port of London Authority
PPE	-	Personal protective equipment
RCD	-	Recreational Craft Directive
RoSPA	-	Royal Society for the Prevention of Accidents
RYA	-	Royal Yachting Association
SARA	-	Scottish Amateur Rowing Association
SE	-	Sport England
TC	-	Technical Committee of ISO
WG	-	Working Group of ISO
WSA	-	Water Safety Adviser (ARA)
WSC	-	Water Safety Code (ARA)

1.0 Introduction

Rowing is a very popular sporting activity that is pursued by many people in England. There are currently 549 clubs registered with the Amateur Rowing Association (ARA), and an estimated participation rate of some 440,000 per year.[1] These clubs range in size from 20 or so members to those with several hundred active rowers. It is in England, a club-based sport with racing from novice up to Olympic and World Championship competition. Most club members are involved in racing and training but a growing number just row for fitness and well-being. Alongside water activity most rowing clubs have gym, weight training and rowing exercise machine use activity pursued within the clubhouse.

The provision of rowing takes place across an extremely wide range of activity, with considerable variation in participant age, type of club, location, type of activity and so on. We have tried hard to examine and consider all those who enable organised club based rowing to take place across this range: encompassing school, university and club activities along with coaching, racing and regatta or heads events organisation. The ARA is the national governing body for both British and English rowing and is recognised as the national federation by the Fédération Internationale des Sociétés d'Aviron (FISA), National Olympic Committee and National Paralympic Committee.

1.1 Purpose

The primary objectives of this review were to investigate:

- The behaviours and attitudes within the sport of rowing towards safety.
- Whether the current ARA Water Safety Code (WSC) is fit for purpose.
- The buoyancy of competition rowing 'Fours' and 'Eights'.

Secondly for this review is to make recommendations for the improvement of rowing safety in England.

1.2 Scope

This review of rowing safety has been undertaken by The Royal Society for the Prevention of Accidents (RoSPA). It is intended to provide guidance for the future of rowing in England. This review is not in any way intended to be an investigation into or a review of any particular safety incidents that have happened in the past, nor is its intention to criticise or apportion blame to any individual.

The sole intention is to review current safety practices and guidance, to produce recommendations that ensure rowing in England is as safe as necessary and that as many people as possible can become involved in the sport in the knowledge that the approach to safety in the sport is as effective and robust as practicable.

The review was limited geographically to rowing in England and only rowing that occurred under the control of the ARA and its club structure. It has commented on and compared coastal rowing as CARA are affiliated to the ARA, but has not considered rowing in any other craft than fine racing boats (rowing boats, sculls or skiffs) and sliding seat training craft.

This review does not compare rowing directly with other water sports, rather it highlights best practice and comparisons that could be drawn, both favourable and unfavourable from other water sports. Observations are also made with rowing governing bodies from other countries and collectively internationally with FISA, the world governing body for rowing.

[1] Annual water sports participation survey, 2006, Ackenford Associates

The research project has been undertaken by the RoSPA leisure safety team. It has been supplemented by a technical expert in recreational boat safety design and buoyancy. See Appendix one for a summary of their respective expertise.

1.3 Terms of Reference

The original terms of reference were drafted by Sport England and DCMS and subsequently amended in discussions with the principal stakeholders in this review, these being:

- The Amateur Rowing Association
- Mr Stephen and Mrs Jane Blockley
- The All Party Parliamentary Rowing Group

The research group brought together by RoSPA would report back to the National Water Safety Forum through Jim Watson, Technical Manager BSAC and James Stevens, Training Manager RYA, Chair and vice chair of the Water sports Safety Advisory Group and members of the NWSF Co-ordinating Group. Validation of the report through the NWSF was thought to be more appropriate than being carried out by any single member of the water sports advisory group or by them collectively.

Throughout this review we sought the view of the individual, the club and the NGB; only by getting a consensus view from them could we come up with conclusions from which workable recommendations could be developed.

1.4 Limitations and Exclusions

In carrying out this safety review RoSPA would point out that audits and reviews are by nature a sampling exercise, therefore the reviewer cannot guarantee to identify all safety hazards within the scope of work. Opinion is formed by a review of the available information, therefore absence of comment on any issue should not be taken to imply that the activities are completely safe and a level of risk is inherent in the sport of rowing. RoSPA has approached this through determining an appropriate level of risk, not the view that all risks should be controlled; our philosophy is to make things as safe as necessary, not as safe as possible.

We have only reviewed the buoyancy issues relating to larger rowing craft (fours and eights), as inherent buoyancy in smaller craft (pairs and single and double sculls) is not in question. The smaller craft do not have the same issues relating to buoyancy as the length of the craft and the ratio of the size of the canvases at the bow and the stern of these boats to the area of open cockpit is much greater. So these craft as long as the floatation provided by the canvases is sound are inherently buoyant.

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2.0 Methodology

In trying to understand 'behaviours towards safety in rowing' and establish if the water safety code was ‘fit for purpose’ we adopted a number of approaches that would enable a stratified view of rowing activity, and importantly the ensuing risk management practice in place. Broadly, we looked at three key areas:

Systems – *Is the guidance, policy, capacity and procedure in place appropriate to deal with the risks presented?*

People – *Are the key people involved sufficiently equipped with the right skills, knowledge and experience to meet the demands arising from the risks and management systems in place?*

Equipment – *Is it fit for purpose?*

To this end, we conducted interviews with key representatives, and stakeholders to the sport, we observed in club practice and carried out a number of sample audits of clubs to gain a better understanding of actual practice. In addition we appraised the current water safety system and considered guidance from further afield. Finally we considered the issues surrounding boat buoyancy. The following section outlines our methodology in detail.

2.1 Interviews

A combination of structured interviews, forum discussion and semi structured individual meetings were held at various stages of the review to establish views from a sufficient cross section of the rowing community. In particular we approached:

Regional water safety advisors

Semi structured interviews and discussions with the Regional Water Safety Advisors with the aim of establishing the keys issues faced by each of the advisors, including their role within the safety system, implementation of the Water Safety Code and the practicalities of the wide ranging remit they hold.

Clubs

Structured interviews with a selection of clubs, in each of the ARA regions, and a number of CARA clubs. These interviews covered standard areas, enabling a wider understanding of the application of the Water Safety Code, the in club views and policy, and issues with managing risk. A sample interview can be found in the appendix. The areas covered in the interview included:

- Implementation of the ARA Water Safety Code
- Crew competency in a capsize or other on water incident
- Management of new rowers
- Responsibilities within the club, and on the water
- Approaches toward risk management
- Behaviours within the club towards safety
- Barriers and current problems with both the ARA code, and its implementation.

The interview lasted up to an hour. Prior to the interview we requested from each club or their respective regional WSA a copy of the annual audit return. The aim of these interviews was not to cover the responses given in the audit but to gain a deeper understanding of why the responses were given, and the particular issues that the clubs had.

These interviews were undertaken anonymously although almost all the clubs were happy for the comments to be attributed to them. We also requested a sample risk assessment undertaken by the clubs, and a sample of key documentation.

The clubs selected for interview were done so with the overall aim of enabling the review team to gather a picture of the full range of rowing activity. Therefore in the majority of cases our selection was not by chance. In order to reduce possible bias in the methodology, we established broad criteria for selecting clubs. This included:

- *A wide range of ability and activity* - including clubs that offered junior rowing, elite rowing, college and university rowing, coastal rowing and those involved in either 'World Class Performance' or 'Project Oarsome' schemes.

- *Regionally representative* – to include clubs in each of the regions.

- *Selection of water conditions and risks* – identifying clubs that operated in relatively benign conditions or high-risk areas. Including canal, regatta course (i.e. Dorney Lake), open sea, harbour and tidal or fast flowing river.

Although the selection was ultimately made by the review team, we asked the RWSA to offer a 'potential' club to interview, on the basis of identifying an exemplar club in that region. In addition to this we used the information within the annual audit returns to help inform our selections. In each of the regions, the research team also made a completely independent club selection.

Pre identified key stakeholders
All of the pre identified key stakeholders were interviewed. Mr and Mrs Blockley were interviewed informally then at a latter date were asked a set of pre-determined questions. The views of the All Party Parliamentary Rowing Group were sought through attendance at one of their meetings. The ARA has been represented by the Honorary Water Safety Advisor. RoSPA also gathered information from attending the ARA's Head Office for a meeting of the ARA Council's Water Safety Working Group and the National Regional Water Safety Advisors meeting.

We also sought the views of major UK rowing event organisers and several other stakeholders including boat builders. We also sought the views of rowing safety experts across Europe and further afield to establish if the practice we found in the UK was significantly different from other countries experience, and if so, to understand the context for this.

2.2 Observed Practice

Site audits were undertaken of several clubs and competitive events across England. This was to establish if there was a significant difference between the policy and direction given in the ARA water safety code and on the ground activity.

The site audits were based upon the RoSPA QSA system, which essentially looks at a given organisation's ability to manage the risks associated with the activities it is responsible for. The approach was modified to allow for the fact that the majority of clubs we spoke to were voluntary in nature. The audits were all prearranged; a member of the research team was accompanied by a club official. In each case, discussions were held about our findings, and the barriers to safety and issues that each of the clubs faced.

We applied the same selection criteria for choosing which clubs to audit as we did for the interviews.

Note on the observed practice
In the original methodology for this study we proposed to postal survey a large number of the clubs to identify issues or problems across a number of regions. After reviewing the ARA annual audit findings (almost all clubs return an annual audit form to the ARA as it is a requirement to be able to register for racing), the team decided not to pursue this, as the system and questions asked already provided us with the majority of functional information we required (e.g. How far the clubs complied with the code in place).

We decided that it would prove more beneficial to pursue a discursive approach with clubs, to understand why they did a given practice, and how the 'safety culture' in club was fostered. The information the ARA audits held proved a useful baseline to further this discussion. As a result of this, we increased the number of sites audits and interviews held with clubs.

2.3 The buoyancy of competition rowing fours and eights

The primary of objective of this section of the review was to consider levels of buoyancy required in rowing fours and eights to ensure adequate floatation when either swamped and/or capsized and to consider the regulation of such.

Due to the technical nature of the issues relating to boat design and the need to carry out an independent review, we engaged a qualified naval architect to consider the technical aspects of boat safety. His report considered boat buoyancy, guidance and comment on workable definitions such as day-to-day issues of implementing an exact measurement of boat buoyancy. This was assisted by conversations with boat builders, FISA and experienced crews and coxes.

2.4 Analysis of Existing Guidance, Structures and Monitoring

An analysis was undertaken of the current Water Safety Code and strategy, its implementation and consideration of its roles as a guidance document in underpinning an in club risk management approach. In broad terms we were mindful of three key areas:

- System
- People
- Equipment

The analysis of any guidance needs to be considered within the controlling system and structures. To this end our review used considered the standard risk management model, (i.e. the POPIMAR model, as given in HSG 65) and identified any key omissions within the system against the demands of the model. In particular we considered the following area within the system:

- Policy
- Organising
- Planning and Implementing
- Measuring
- Auditing and Reviewing

In assessing the existence and quality of system in place, we evidenced and evaluated the above areas, as an indication of a 'safety system' and 'positive safety culture'.

This was assisted by discussion with members of the central water safety committees, who are currently redeveloping the ARA central guidance. The impact and relative importance of external regulation such as the 'Tideway Code' and FISA regulations were also considered. In particular the disparities between these and the current WSC were considered.

Throughout the study, we considered the current role and responsibilities within the club, the ARA and the relationship with the Governing ARA Council and the coaching structure.

Although it is widely accepted that existing incident data is scarce, we examined the data available, both in club and nationally. Further to this we held discussion about the use of incident data as a tool for promoting risk management within the ARA clubs, and requirements for the future. We also considered a number of other voluntary systems in place to assist ARA in further developing their system.

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3.0 Generic assessment of hazard and risk within the sport of rowing

Despite the lack of sufficient data around incidents and injury this is our reasoned understanding of the risks and hazards associated with all rowing activity. To reach this conclusion we have reviewed existing documentation and compiled an as objective view as possible. This understanding has informed our identification of in club rowing related risk.

3.1 Water Based Activity

Rowing is a water-based sport and so the main danger within the sport is associated with water. Rowing occurs on such a wide range of water types from shallow narrow canals to large tidal expanses of water, perceptions of the risk and the actual risk of the water will vary immensely. The three main risks associated with the hazard of water are*:*

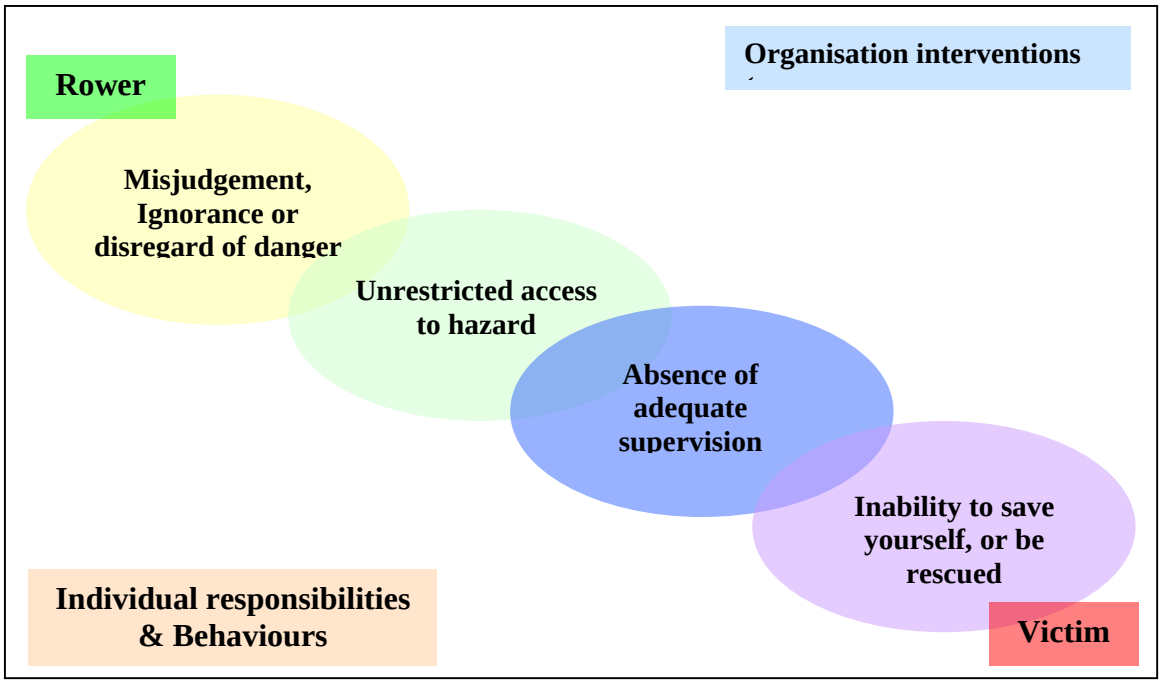
- Drowning through immersion.
- Physical injury and over-exertion related health problems.
- Health problems and medical conditions associated with contact with cold, untreated or polluted water*.*

Drowning

Drowning may occur after either accidentally falling or deliberately accessing the water. It is often a consequence of one or more of the following factors:

- Uninformed or unrestricted access to the water hazard.
- Ignorance, disregard or misjudgment of the danger.
- Lack of supervision.
- Inability of the victim to cope (or be rescued) once in danger.

The main cause of potential danger to a rower is likely to be ignorance or misjudgment of the danger. However from the drowning chain below there is a relationship between the individual participant and the organisation(s) responsible for the activity. Therefore there is balance between the individual's freedom and responsibility and that of the club and ARA for them that will vary depending on the age and experience of the individual.



Physical Injury

Although drowning is the most severe of incident outcomes physical injuries are more likely. They will be exacerbated by wet and slippery conditions of a water environment and usually be a result of falls, slips, trips, impact and entrapment. Impact and entrapment injuries will be as a result of collisions between other water craft particularly other rowing boats and fixed objects and hazards to navigation such as bridges, pontoons, weirs, locks and sluices. Over-exertion injuries or ill health (relating to existing heart or medical conditions) caused by exhaustion and dehydration can result from rowing activity.

Ill Health

The temperature of the water and its variance from the air temperature can cause many problems for rowers who end up in the water. Although they are less likely to end up in the water than other water sports participants such as dinghy sailors, windsurfers and canoeists, when rowers do they are usually far more vulnerable. Those previously mentioned are in the water more often, so are usually wearing personal protective wear such as wetsuits, dry suits etc. as well as buoyancy aids, life jackets or other PFD's.

A tired rower without a PFD, wearing training or competition kit is very susceptible to the effects of cold water; hypothermia, coldwater shock and cramp, (all resulting from immersion in cold water). This vulnerability means that cold water can be potentially life threatening and survival times for rowers in the winter and early spring can be very low.

Water can both contain contaminants (such as pollutants) and toxins that cause ill health, and be the medium to promote the spreading of bacteria that cause disease and infections. Blue green algae toxins, leptospirosis, cryptosporidium and e-coli are some examples. Exposure to such water can be hazardous and many rowing clubs operate on untested water.

3.2 Land based

Land based activity can also lead to injury, the main causes being:

- Manual handling, launching, recovering, lifting and carrying rowing/sculling boats and rescue, coach and umpiring craft.
- Maintenance, course setting, lane clipping, boat repairing activities, weight training, gym exercise.
- Transportation – loading and towing trailers together with driving risk.

4.0 Generic Management of the Risks of Rowing

Safety hazards when risk assessed are usually controlled by:

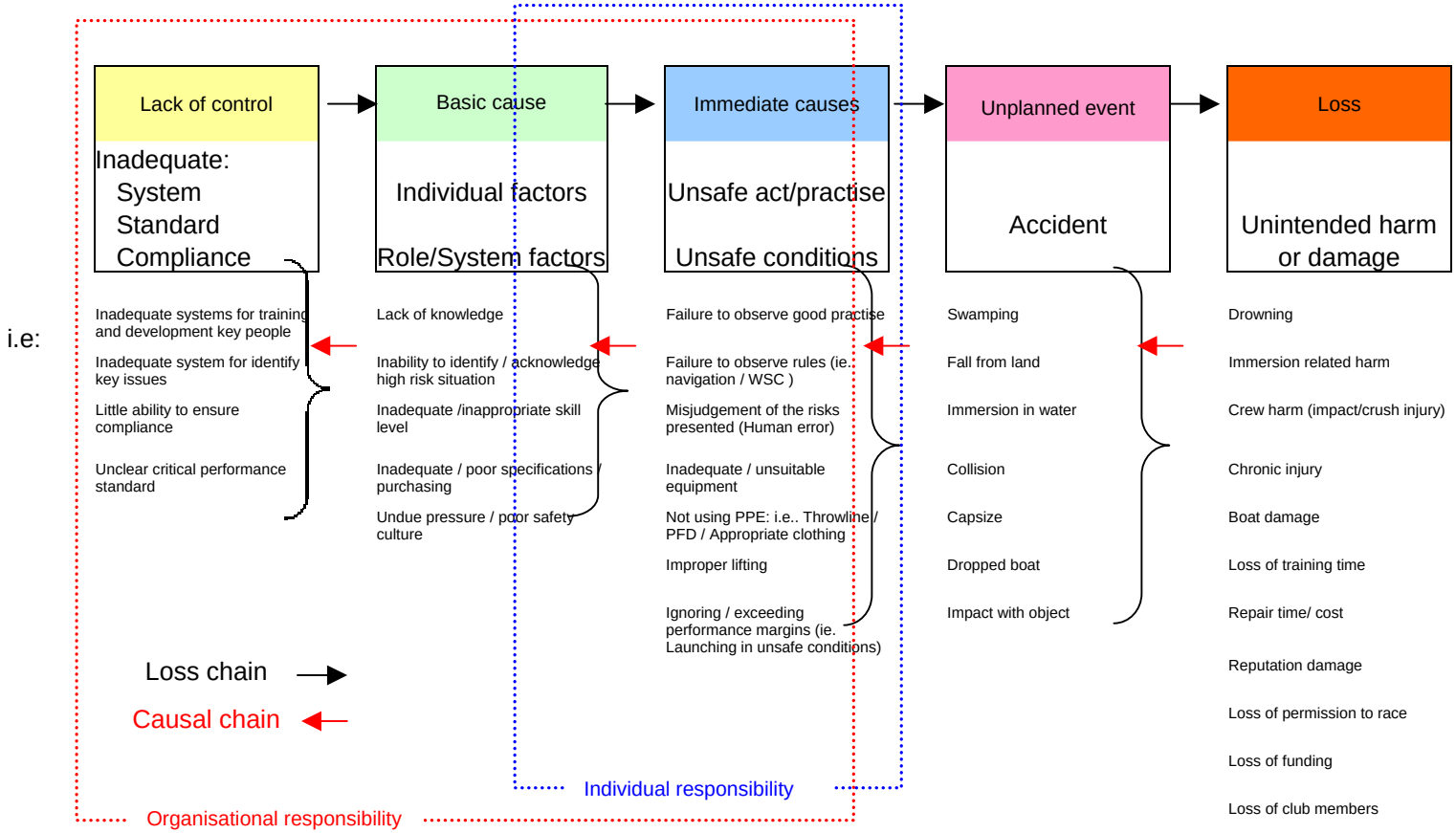
- Physical features to deny or control access, such as barriers or gates.
- Education to raise awareness of the dangers by providing information through training, induction, signage, leaflets, etc.
- Regulation through standard compliance, adherence to bylaws, agreed codes of navigation etc.
- Supervision with a physical presence on site and on the water.
- Having in place agreed operational procedures such as formal written Normal Operational Procedures (NOP) and having an Emergency Action Plan (EAP) and, when deemed appropriate, rescue equipment and Personal Protective Equipment (PPE) for those involved in the activity.

A risk assessment review can be used to determine what should be done, but in itself it can be only part of a total assessment strategy. The conducting of such only ensures that there is a full understanding of the hazards and risks, which is the basic premise of why a risk assessment should be carried out. The risk assessment strategy should highlight the need for documentation such as the NOP or EAP, formal supervision or information dissemination arrangements.

The starting point to establish a safe activity is to develop a safety management system based on risk management and hazard mitigation (see example of loss causation model overleaf).

Loss Causation Model

Loss causation model, with possible examples to Rowing



5.0 Review of Legislation and Standardisation applying to rowing boats, equipment and rowing activity

5.1 Existing rules, codes and guidelines

FISA Rules
FISA, the Fédération Internationale des Sociétés - International Rowing Federation, is made up of around 130 federations worldwide and sets the rules for international and Olympic competition, doping control etcetera and beyond that act in an advisory capacity.

FISA publishes '*FISA Rules of Racing and related byelaws***'** on its web page[2]. In particular we were concerned with the rule specifically related to construction of boats and buoyancy guidelines. In particular part IV: Boats and Construction states that:

"*The construction, design and dimensions of boats and oars shall, in principle, be unrestricted subject to the limits laid down in Rule 1, paragraphs 1 and 2, and Rule 58. Nevertheless the Council of FISA may, in the Racing Bye-Laws, impose appropriate requirements."*

(Rule 31 - Free Construction)

Byelaw to Rule 31 - Boats and Equipment

1. Requirements for racing boats:

1.2 All boats and oars shall comply with the requirements set out in the Byelaws to Rule 41, below (name, symbol, etc.).

1.5 To avoid accidents arising from capsizing, all boats shall be equipped with stretchers or shoes that allow the competitors to get clear of the boat without using their hands and with the least possible delay.

1.10 Boats constructed or delivered after 1st January 1998 must have a production plaque or equivalent visible and permanently affixed inside the boat, up to 50 sq cm in area, on which is written the name and address of the boat builder, its mark or logo, the year the boat was constructed, the average weight of the crew for which the boat is designed, and the weight of the boat on construction or upon delivery.

1.11 Boats constructed or delivered after 1st January 2007 must also show on the production plaque (in 1.10 above) whether the boat meets "FISA's Minimum Guidelines for the Safe Practice of Rowing": "A boat when full of water with a crew of average weight equal to the design weight stated on the boat's production plaque, seated in the rowing position should float such that the top of the seat is a maximum of 5 cm below the static waterline."

ARA Rules

Boats & Equipment
"*It is the responsibility of the individual Club member and the Club to ensure that all equipment is safe for the purpose for which it is intended and that it complies with the Code. Particular attention is to be paid to the following*"

(Section 1.11)

[2] http://www.worldrowing.com/index.php?pageid=71

"Boats constructed after 1st April 2003 must have inherent buoyancy sufficient, together with their oars and sculls, to support a seated crew of the correct design weight in the event of being swamped."

(1.11.45.1)

Additionally the ARA publishes guidance as follows:

"All equipment used for rowing, sculling and coaching needs to be properly and regularly maintained to ensure that it is safe and adequate for its intended purpose and to ensure that it does not expose its users to danger. All new boats constructed after 1st April, 2003 must carry a plate indicating the maximum average crew weight the boat can carry and support seated in the event of being swamped. A club or individual purchasing a new boat must ask the manufacturer to supply this information. "

(2.6.1)

Attention must also be paid to the following:

"If, after risk assessment for a planned activity, it is judged that a boat, new or old, does not have sufficient inherent buoyancy, additional buoyancy should be added."

(2.6.1.2)

The reason for having a risk assessment for "old" boats and not insisting on added buoyancy at all times, recognises that many of these are intended never leave their sheltered inland waters, nor go to places where there is the risk of swamping.

5.2 Relevant British and European legislation

- As primarily a voluntary activity involving willing participants and volunteer club and regional officers and coaches the activity of non-commercial rowing is outside of much of the Health and Safety at Work Act (HSWA), however the overall organisation of the ARA and the role of volunteers is a grey area. In some respects they need to be regarded in a similar light to employees of a commercial organisation and so protected in the same way with a similar duty of care shown to them. Coaches employed by the ARA and deployed within a club or housed within a club are employees and so the whole of HSWA and subsequent regulations do apply to them and those clubs and the ARA need to ensure that their duty to their employees is met.
- Rowing is outside of scope of Adventurous Activity Licensing Regulations (1996) so activity involving those under the age of 18 years is not externally audited.
- Rowing and the ARA were not considered by the recent AAIAC review of outdoor and adventurous activity provision and accreditation.

5.3 Applicable British, European and International Standards

- EU Recreational Craft Directive applies to rowing boats, but they can be excluded if they are solely intended for racing and marked as such, otherwise they require CE marking.

5.4 Other Guidance

- Only accreditation relates to schemes such as ‘Project Oarsome’ or whether clubs have achieved world-class performance status.
- Some waterways such have binding agreements with the relevant navigation authority that grants clubs access to waterways. An example is the Tideway Code on the River Thames, which, is an agreement between the Port of London Authority and the Thames Region Rowing Council. This document defines access and navigation and has sections on general rules, navigational rules and additional rules such as the reporting of incidents and regulations relating to the use of coaching launches.
- Other waterways will have less complex access and navigation rules but these similarly need to be adhered to allow access to continue.

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6.0 Findings

6.1 Rowing Club Interviews

We found most respondents to be in favour of the review, though some felt that it was unnecessary as *"rowing was safe",* but were still prepared to contribute to the review. As stated earlier, we adopted a semi-structured interview approach, seeking to establish views on the following topics:

- Implementation of the ARA water safety code
- Crew competency in a capsize / on water incident
- Management of new rowers
- Responsibilities within the club, and on the water
- Approaches toward risk management
- Behaviours within the club towards safety
- Barriers and current problems with both the ARA code, and its implementation.

In identifying the in club 'behaviours and practice towards safety' we applied the standard POPIMAR model to enable identification of the various facets required to establish a robust safety system. The above areas were designed to sample key areas within the club, where possible we cross-checked the answers given with those stated in the annual audit return form, or more commonly we sought to elaborate on the function questions to better understand, in club attitudes and behaviours.

To ensure that clubs would be happy to talk freely and openly about rowing safety at their club, and provide an honest opinion, the interviews were conducted with the understanding that the responses would be treated anonymously. As such, all interviews conducted with rowing clubs are anonymous and only identifiable by region for the purposes of analysis.

All of the clubs questioned reported they had a safety policy in place. The activities and areas covered ranged from quite tightly focused policies *"The main areas (being)… junior, senior, beginner, buoyancy"* to simply displaying the ARA WSC.

A number of the areas had developed specific regional codes, as a result of the environment and activity they were involved in. Noticeably, the Thames clubs are subject to the Tideway Code on a daily basis whilst the Northern clubs have developed a joint Tyne code, which endorses the ARA WSC, both of which go further to allow for locations specific risks such as navigational issues. When asked to elaborate further on the rationale behind the policies a number of key statements were made:

"Beginners need to be aimed at specifically. It's generally any area that poses a risk." (Club NW 3)

"Historical incidents and gets added where gaps are highlighted comparison between our code and ARA WSC." (Club Northern 2)

" We follow the ARA Code. If don't follow ARA, it's a step into unknown and against our insurance policy." (Club: Wessex 2)

The overall view towards safety was that it was an important consideration, and they felt they were involved in a safe activity, but there was always a risk, and room for improvement. Almost all pointed to the very small number of fatalities and serious injuries associated with the sport as an indication of how safe the sport was.

The majority felt that rowing was an activity where the individual participant should primarily take responsibility for their own safety and it was up to them whether they did this or not. A number said that the guidance should be more risk-based and cooperation led, as opposed to compulsion/compliance based approach, though that is in reality, what many did. The typical answer to this question was:

"Club Safety Adviser; Coaches - this is then asked of everybody" (Wessex 1)

"Club WSA: All responsible, but coaches particularly deal with equipment safety and failure reporting. Committee: The WSA advises the committee…it's up to the committee to implement."

(Wessex 2)

Of interest, the role of the coach as the key person responsible for safety was cited more frequently than the WSA and committee members. The role of the coach in identifying failures both in performance terms and equipment, in addition to their status within the club may be partly responsible for this response. The decision process for establishing the roles within the club was clearly dominated by a number of factors: the experience of the individual, and the need to have a WSA within the committee structure.

When asked to comment on the statement: "*Safety in my club is driven more by direction from the ARA WSC than the in club risks".* The majority of people were either neutral to the statement or in strong disagreement with it. This correlates with the opinions cited earlier about individual responsibility:

"Driven by both – both are powerful drivers; Club sensitive to safety record; Don't want bad press; Don't want to be in press – so take safety seriously; Want to keep their sport safe; Look after each other and themselves."

(Club: Northern 1)

"The club is driven by experience of members and committee. ARA doesn't take a hand's on approach. The club has implemented things to ensure self-preservation."

(Club: Yorkshire 1).

"Half and half, Can't purely use ARA as they don't know rowing conditions… Procedures and guidance from ARA…Especially coastal – different circumstances can't dictate local conditions…club has best technical knowledge of conditions"

(Club: Wessex 2)

The clubs acknowledge that the role of the ARA in establishing the framework, and disseminating best practice, however many asserted that the 'technical knowledge' lay within the club. Answers regarding responsibility ultimately were mixed, many clubs indicated that they adopted a self-preservation stance, and that the ARA was often perceived to be distant from club activity.

When considering the particular risks in club, the majority of clubs responded that they formally recorded the findings of risk assessments, that these findings were driven primarily by experience, and that there was scope for changing conditions (dynamic

assessments). However a number of clubs offered a neutral or no response to this, and one club stated they didn't formally record the risks.

"Both clubs I am involved with have been around for 100 years – so risks are common knowledge.. experience of coaches and members. Risk assessments of both sports risks and locations." (Club: Wessex 1)

"Several risk assessments in place, although they have no training – seminars keep them updated; Experience of the water is essential as this assesses the location… Risks identified on day basis; More experienced people decide on factors."
(Club: WAGS 1).

Coldwater immersion, bumps and bruises, collision injuries, line of sight and supervision issues, swamping, capsize and drowning were the commonly identified risks. These risks were communicated to members using briefings, bulletins, and inductions and via coaches. However, some clubs were specific about the uptake of the messages. Serious incidents and reportable incidents were put in a newsletter, and often discussed at committee meetings.

We asked the clubs if, in their opinion, are "*all the crews competent to deal with a capsize situation?"* and to explain why they thought the situation was as such. In a *minority* of the cases the respondents could say for definite that all their crews were competent in such a situation. The typical argument for this was:

"Capsize drills and swim tests. Beginners are sorted straight away in swimming pools."
(Club: Yorkshire 2)

A number of clubs were less certain but still positive that the crews were competent; of those that were less certain, the lack of everyone in the club performing a capsize test seemed to be at the heart of this, a typical response was:

"We hope they are – but don't know; we encourage them to come but can't make them; Opportunity is there to participate in capsize drills. Key message of "Stay with the boat" – is on noticeboard…"

"Under 18's have to do them; Confident of juniors being competent. Capsize drills once every six months in swimming pool. Has been suggested at committee to have them more often but lack of volunteers to do this, and generally happy that this is often enough."

(Club: Northern 2)

Those that were not at all sure questioned the difference between the benign environment of the swimming pool and open water conditions. The club below implemented a capsize drill practice policy, but were still concerned about the in-pool experience being transferred:

"They don't know if they are competent unless it happens. I don't believe you can replicate the situation in a swimming pool. Swimming tests are completed."

(Club: Wessex 1)

Buddy systems, safety launches and booking in/out of crews were the main approaches to dealing with un-witnessed capsize. These were cited in addition to the "stay with the boat" rule.

In addition to specific improvement to the WSC, identification of the key problems and barriers to change was discussed. In terms of barriers and issues the following were reported by the clubs:

"*Sport is voluntary so can't really stop people doing things that are possibly unsafe. Getting people to obey the rules with a voluntary system is the biggest thing/issue."*
(Club: Yorkshire 1)

"Money; People doing what told; Coaches doing what told; High drop out rate."
(Club: Yorkshire 3)

"Old farts set in their ways and not wanting to change!"
(Clubs: WAGS 1)

Issues of compulsion run through each level of the review. The members realise and want a voluntary system, but consistently identify this as a, if not the, key weakness running through the risk management system and WSC.

In terms of improvements members were generally positive about the code and support was expressed for a move to positive goal setting. A number of additional technical guidance notes were requested, such as those involving visibility, and ratio of coaches to younger rowers. A number of clubs requested that the ARA just adopted a position in the WSC that:

"WSC should state that all boats are to be buoyant. It would be very helpful."
(Club: Yorkshire 3)

"Based on risk. Less of 'don't do it' and more of 'do it'. Overall guidance is quite good."
(Club: Yorkshire 2)

However one club was very clear about the improvements in the code:

"Appreciate that it is very hard to write a set of rules that is appreciated/understood by everybody… However, the WSC and guidance very hard to understand … Lacking a bit of what you have to do but not how you do it… Swimming form/membership form very good, but needs to be hand's on… Lack of showing best practice… Get good support… Buoyancy issues have been a shambles."
(Club: Northern 3)

Many respondents, particularly nominated club safety advisors, felt that they needed more assistance from the ARA in instigating change, especially when dealing with older experienced rowers who could not personally see the need or benefit.

Some thought that the widespread and often stated attitude of rowing being a very safe sport, encouraged a complacent attitude to safety amongst ordinary rowers and the perception that safety was a function of the WSA, not them. In particular *one* (recreational) rower was vocal in concerns over certain attitudes, in particular:

"To say 'I'm not going out there – it's too rough…' was seen as a sign of insufficient commitment"

and that the approach to beginners was:

"Beginners are put out in five boats in busy rivers – sink or survive (Gung Ho) attitude. The others leave."

This may have been as a result of a negative personal experience, however it did mirror some of the quiet concerns raised during our discussion with other rowers, particularly those who entered the sport later in life, or mostly viewed rowing as a recreational activity. One advisor noted that the fixed training schedule could be partly to blame for the development of this attitude, in so far as you have a set number of weeks to get the crew fit and ready to race; a missed number of days could be the difference between first and third place.

Overall it is our opinion in the majority of cases that the clubs adopted a pro-active approach to managing in club risks. The code is a useful factor in determining the structures, and appropriate measures, but it is not the only source of knowledge that should be utilised.

In the opinion of clubs' members the issues of capsize drills and boat buoyancy, should be handled more decisively by the ARA. Having better incident monitoring systems would enable a more robust, objective position to be taken by the ARA, and would deal more decisively with the issue.

The underlying issue of control has been identified within the club environment. Clubs generally complied with the ARA guidance and all of those surveyed completed their annual audit. Very few said that they got feedback from this requirement and some questioned the relevance of going through this exercise.

6.2 Site visits and observations

Similar to the structured interviews the club officers involved in showing the researchers around their clubs were again very helpful and many were pleased to get a review of their safety arrangements from an independent source. Again they believed that they were more responsible for safety than the ARA but wished to see more support and feedback from the ARA on their activities.

One comment from a Water Safety Advisor, when on arriving onsite and requesting to see a copy of their annual audit form was that "I am really pleased you are going through this with me as I have completed this form for the last three years and received no feedback from the ARA".

During the visit the clubs were questioned about how the auditing process could be improved. Because many felt that little was done by the ARA with the results from them, they did not always see the benefit of carrying out the exercise themselves; many would have preferred an outside independent review, whilst others preferred the in-house approach as they found benefit in doing it themselves as it made sure that they carried out many safety related checks and tasks.

All of them realised the importance of the audit in terms of its completion being a hoop that must be jumped through in order for the club to be able to race, and as such realised it was an important tool that could be used more effectively by the ARA.

When questioned about boat buoyancy, clubs replied that they would comply with ARA rules if they were changed in relation to all boats being used having to be buoyant. The larger clubs often saw this as only a minor problem as they had only a few non-buoyant boats and these would be replaced in the next 3-5 years anyway.

Boat buoyancy was deemed to be more of a problem for the smaller clubs visited as they could not replace boats so easily and often received second-hand boats from larger clubs.

When checking how activities were managed on a day to day basis, where and when rowing activity would take place, especially if in dubious conditions strong winds, rough water etcetera whether rowing would be allowed or not, all clubs appeared to have experienced club officials on hand to make those decisions. However knowledgeable they were this process was not particularly well documented and evidenced.

Some clubs did not have fully developed risk management systems in place. They did not have evidence in place through specific risk assessments as to why they did or did not perform various safety tasks or had safety-related measures in place. One club for example although having what appeared to be good safety measures in place, did not have site-specific assessments pertaining to the water that they operated on. This meant that safety measures in place such as having to have a rescue boat on the water for example was a requirement of the body giving them permission to access the water rather than a control measure that had naturally spilled out of a risk assessment. Other failings occurred where control measures proposed in risk assessments were not found to be in place on the ground during activity.

Many rowers were not particularly concerned about safety. The WSA often struggled to get the support of rowers to complete safety-related tasks. Some clubs did not have boat or crew daily launch and return logs, comments such as: ”We can see who’s on the water” were used to defend the absence of such recording.

6.3 Stakeholder Interviews

APPRG
The All Party Parliamentary Rowing Group was met with on 17 July. They were happy to be informed about the scope and purpose of the review. They were supportive and brought up the necessity for ensuring coastal clubs were included within the review. They also questioned dissemination of education to all clubs and the ability of smaller local clubs to implement any changes.

Mr Stephen Blockley and Mrs Jane Blockley
The Blockleys have a number of changes they would like to see in the management of safety in the sport of rowing. These changes cover the areas of cultural attitudes, equipment, training, and incident reporting. They substantiated their points with evidence gathered and details relating to timescales, costing, overcoming resistance, ensuring implementation, and also provided solutions.

They suggest a revision of the WSC into three separate codes – one each for the individual, coach and club. Basic safety rules and performance standards are recommended to be compulsory, with an understanding that realistically individual rowers may not have competency to undertake risk assessment. They believe that safety messages from the ARA need to be communicated more overtly with a more positive safety image, and suggest compulsory basic safety training for all members, including beginners and new members. More accurate and informed training documents are seen as necessary, along with refresher training and informal training becoming part of club culture. They believe the ARA reporting system currently does not provide sufficient feedback and suggested an improved online-accessible system.

The Blockleys propose that boats should meet FISA minimum buoyancy standards and that the current ARA guidelines on buoyancy are confusing. They also believe the current ARA guidance for heel restraints is wrong, and that guidelines on the wearing of lifejackets seems to imply weakness of the individual. They pointed out that members should be aware of the limitations of launches regarding rescue ability.

ARA

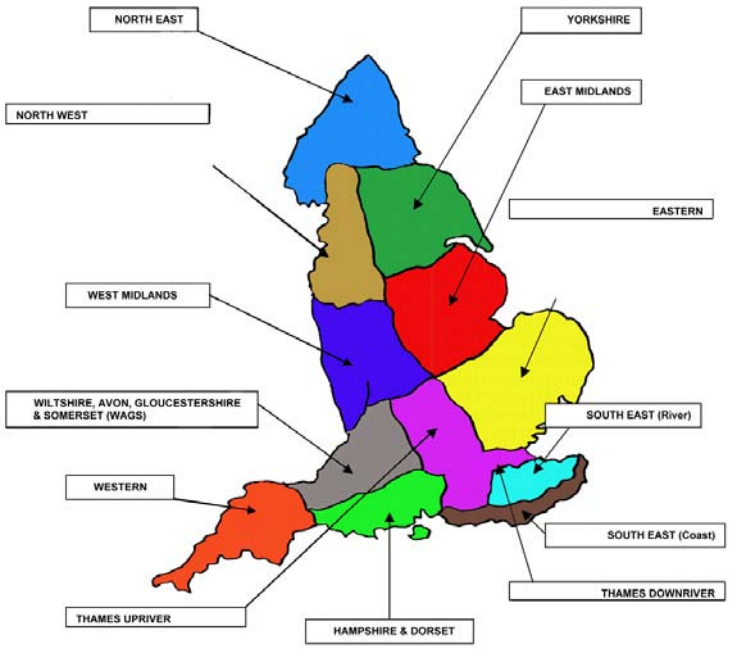
The review was discussed with the ARA on May 1st who thought it was important that clubs interviewed and audited provided a good demographic mix. They discussed the importance of the voluntary aspect of rowing. The ARA were concerned about comparison with FISA guidelines as FISA are interested only in the competitive element of rowing, whereas ARA is aimed at the whole of the sport and at a national level. The ability to manage responsibilities in relation to boat manufacturers and wider stakeholders was believed to be a current problem. The ARA sees a benefit from this review in relation to the auxiliary activities of rowing.

Regional Water Safety Advisors

Semi-structured interviews and meetings were held with the Regional Water Safety Advisors, in addition to representatives from the Coastal ARA (CARA) and British University Rowing. The interviews covered a number of areas including the role of the RWSA, the difficulties they face in 'doing the job' and understanding the key issues that face the clubs with respect to risk management. In total 11, semi-structured interviews were held, in addition to discussions at a WS working group meeting and the National WS committee meeting.

The post of the Regional Water Safety Advisor (RWSA) is voluntary; they sit within each of the 12 regional committees, and in effect act as a conduit between the Regional Council (RC) and the clubs. They are there to oversee the implementation of the WSC, and to support or advise clubs on matters of safety.

Map of ARA regions



It became clear that the role of the regional advisor, although guided by a job description, was approached with a very wide degree of variance. To some extent this is expected, as individuals will work to their own strengths and abilities, however the perception of the key responsibilities was not uniform among the RWSAs. A number of the regional advisors reported that they approach the clubs in a 'nurturing fashion' whilst some relied upon a more draconian 'carrot and stick' approach.

Possibly the key reasons for the wide range of approaches is the equally wide range of activity and size within the regions. An example of the diversity among the regions can be illustrated when we consider the Yorkshire and Northern regions with Thames. The latter is the region with the majority of rowing activity taking place; there are specific regulations in place (Tideway Code), with some of the highest risk activity and environment for crews to contend with. However this is within a relatively confined area geographically for the RWSA to deal with. In Yorkshire and the Northern region the RWSA is limited by the sheer size of the area within the regions, although the number of clubs and volume of rowing taking place is much lower, and in some locations with much more benign water environments.

Virtually all of the RWSAs identified regional and national competitions as the key opportunity to meet, disseminate information and establish the actual standards and approach to water safety within clubs, as many of the RWSAs struggled to visit their clubs, and observe practice at first hand. There was acknowledgement from the RWSAs of the inherent weaknesses in this approach; namely that the best boats and or crews attended, and issues within those crews or clubs could rarely be seen at an event.

The responsibilities of the RWSA can broadly be broken down into four main areas: Guidance and Support, Communication, Coordination, and Control. This includes collating and analysing the annual safety audit forms, supporting clubs and river users, being the first point of contact within the region to deal with water safety issues, in addition to disseminating best practice and reporting to the various working groups and regional council. A number of the RWSAs reported that they would omit areas of their workload completely, and focus on what they perceived to be the key issues within their region.

Evidence of using the annual audit forms to identify, prioritise and manage risk was not widespread among the RWSAs. This may partly be due to the relative immaturity of the system, however the perception of under or mis-reporting undermined the potential usefulness of the system as an injury surveillance tool and risk management indicator. One of the immediate issues that stems from this is the lack of robust evidence to assist RWSAs in prioritising their workload.

During the latter conversations, the role of the paid regional coaching development officers was discussed. Their role and potential to support and link more closely into the objectives of the WS committee was considered. A range of views were expressed upon the capability of the CDO to assist, with the general consensus being that many of those in position had chosen not to 'challenge the status quo' within their regions. There was in a number of cases a clear distance between the paid CDO, who will regularly be involved with club matters, and the RWSA. A précis of these views is outlined in the table below.

It is clear from our discussions and meetings with the RWSAs that they are professional, dedicated volunteers who are trying to enable the sport to continue its success. The wide ranging and time consuming role that the RWSA fulfils is personally

very demanding, and as such the RWSAs have each shaped the role to suit their local needs and personal abilities.

This role is the vital link in ensuring the ARA water safety system continues to exist. We are of the opinion that there are too many demands placed upon the people in this part of the system. This can be evidenced by the tendency to 'do the important bits' and in some cases completely ignore the maintenance of the system and monitoring function. To this end we would strongly suggest that:

The ARA undertake a long term programme of capacity building in these roles, focusing on the current incumbents, as well as identify future post holders. They should receive *at least* a basic formal qualification in risk management.

That the ARA look to remove a level of the administrative burden upon the RWSA. The approach of using online /distributed technologies to enable online reporting of audits forms and incidents is a good 'possible' solution. However, in essence the RWSA should be the enabler and technical point of contact for clubs when something goes wrong; currently they are burdened with maintaining systems and procedures, which could distract them from 'core' activity. Better working relationships and use of the CDO may assist with this, along with exploiting technologies.

The role of the RWSA needs to be focused on them being the enabler and champion, to back up the club advisor and disseminate positive practice, in addition to being the first point of contact for the resolution of club issues.

Region	WS Advisor / Representative	Background & Geographical Coverage	Key points
Northern	John Mulholland	The Northern region of the ARA is a very large area bounded by the River Tweed in the North, and the River Tees in the South, Brampton in the West and the North Sea to the East. There are thirty-seven rowing clubs within the region with a very wide geographic spread.	Size of geographical coverage means: - Not many spot checks - Contact via phone or email, or at races (Head of the River race) WSC - Legal document - Designed to cover everything - Not very accessible - Introduced from the start – not always introduced - Clubs need own instructions - More relevance to key individuals in the club - Competence scheme for beginner s - A page for each key aspect Paid coaches hard to get due to lack of money New coxes – clarity over who should take charge Bureaucracy limits children getting into the sport People don't bother to fill in incidents – it is a struggle to persuade them to – they don't see a benefit to the club. Veteran beginners – no national money given towards them Advice provided: - There are circumstances where you will get away from the boat - Cold shock immersion - Boat will float – get on top of the boat - Get yourself into a safe position.
North West	Tim Hooper	The North West Regional Rowing Council represents the clubs and events within Lancashire, Cheshire, Merseyside, Greater Manchester and Staffordshire areas. The North West has been major player in Project Oarsome with seven schemes developing formal links with over 14 schools in the maintained sector.	

Yorkshire	Allan Clarke	The Yorkshire Regional Rowing Council represents the clubs and events within the counties of West, North and South Yorkshire together with the Humber. There are in total 21 clubs in the region. The majority of these are engaged in river rowing but there is a developing interest in both coastal and indoor rowing within the region.	Regional safety advisor - Visits management meetings – negotiated to attend meetings, but can often turn up and speak. - Had to ban clubs from taking part in events, and had to spell out responsibilities within one club. Under reporting of incidents. Clubs are becoming more about risk management – safety adviser is being listened to. WSAs don't get a lot of assistance from others – i.e. write risk assessment with no further input from anyone in the club. Club safety advisor should undertake an ARA training course before they hold the post. Boat buoyancy is a good idea. Universities can row from the same boathouse but they don't have the same level of control over these clubs – problems over controlling this. Barriers to safety include the ethos of seniors who, having seen it all will go out in water that they shouldn't. Compulsory capsize drills are not practical.
East Mids	Bernie McGuckin	The East Midlands Region is a compact region with a very long tradition within the sport of rowing. The region encompasses Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire and parts of Staffordshire. There are 25 clubs in the region and a number of events. The National Water Sports Centre in Nottingham provides a strong focus for the region and many national and international events are held there.	Unable to arrange interview
West Mids	Chris Anton	The West Midlands Regional Rowing Council (WMRRC) represents the clubs and events within Worcestershire, Herefordshire, Shropshire, Greater Warwickshire and Birmingham.	Unable to arrange interview
Eastern	David Watson	The Eastern Region Rowing Council (ERRC) encourages the development of rowing through the affiliated clubs and events within the boundaries of the region. The region includes Bedfordshire, Cambridgeshire, Essex, East London, Hertfordshire, Milton Keynes, Norfolk, Northamptonshire, Suffolk and is the ARA's second largest in terms of membership.	ARA Audit returns had the effect of bringing the clubs to task. Worked to bring in the colleges. Not all colleges will race/run to ARA rules. Run under CUBC rules – unless they start to comply with requirements as laid down ARA document. Regional Advisors – difficulty of size of job. - Winter League provides a bottleneck where can visually see clubs. Need to make it easier for clubs to manage the risk - Template format – to help club - "Proforma" WSC is pretty well driving into clubs. Racing incidents – not picked up, underreporting, so nothing to evaluate. Danger of becoming overly bureaucratic. No national database that provides clarity**.** Lack of standard/ qualification for coxes – "Set up by ARA – have coxes training for coxes" – specifically to London/Tideway. There is a balance between safety and enjoyment.

Thames	Neil Jackson	There are 60 open rowing clubs, 60 universities and colleges, 46 schools and 70 events, including 30 regattas and 40 head races. The clubs are all based along the course of the river Thames from its head waters to Tower Bridge. The region's registered rowers represent approximately 41% of the ARA's total registered membership. The 2000m course at Dorney Lake near Eton was the venue for the Rowing World Cup and the Coupe de la Jeunesse in 2005 and the World Rowing Championships in 2006. The recently opened 2000m Caversham rowing lake near Reading provides a first class training facility for our high performance athletes. http://www.thames-rrc.org/safety/	Saw the audit scheme as purely an administrative task that had limited merit in managing safety. Thought that event permission granting and the enforcement of the Tideway Code were more useful and concentrated on these activities.
SE River	Chris Foley	The South East Regional Rowing Council (SERRC) is a representative body made up of rowing clubs and events affiliated to the ARA in Kent, Sussex and South East London.	Unable to arrange interview
SE Coast	Andy West	The South East Coastal region comprises clubs in Kent and Sussex. The clubs have a rich history and proud traditions to maintain. The region is also aware that this is only part of the story and that the clubs need to be innovative in order to develop rowing still further.	Coastal so comes under CARA - Water safety comes under racing Launching is related to forecast/weather conditions, and the coach/captain will make the decision based on rowers' capabilities. Boats have self-bailing Everyone has to book in/out – most clubs have a similar process – adopted from ARA Single – never allowed alone or without a launch Swimming test – once a year basis/everyone Capsize – not that big a deal Launch - Doesn't always go onto the water, the quads in some situations will be better - Rely on coastguard, and tell the Coastguard as a matter of course, especially for regatta - Busy night – could have up to 10 crews on the water – up to 3 miles away - A lot relies on judgement – all about "managing the risk" Balance you choose to keep "ARA WSC is huge" doesn't always apply to clubs in this region. Use own accident book – don't send in details about people tipping in as you can't avoid it in the sea. Not many people wanted to fill in the logbook. Run both systems – CARA & ARA. Advice - "If it sinks you stay with the boat" Dover Rowing Club safety policy has the catch phrase of "Remember to always risk assess the condition/people/equipment" providing them with flexibility afforded by an inherent dynamic risk assessment.

Wessex	Steve Bull	The Wessex region represents rowing clubs within Hampshire, Dorset and the Isle of Wight. The majority of these clubs are based along the coastline and a mixture of both coastal and river rowing is undertaken by the clubs. There are 26 clubs in the region, including four school and three university clubs.	Coastal – (Hants/Dorset/IoW) separate to the ARA but clubs recognise WSC/main document. Needs extra guidelines for rough water. Has a small region - Annual water safety meeting (14 clubs) – reviews incidents, boat inspection and a peer review is undertaken. - Random audits – one school asks for an audit. - Confirms safety advisors – two formal communications per year Audit allows feedback to clubs on 'ID' problems Logbook – not everyone is aware and summary of reports are not mandatory. People are wary of reporting incidents WSC is still quite cumbersome
WAGS	Phil Clements	WAGS Regional Rowing Council represents all members across the counties of Wiltshire, Gloucestershire and Somerset, and the unitary authority areas previously referred to as the county of Avon.	Felt that self-audit scheme with its limitations was preferable to peer club audits done by neighbouring clubs – inter-club rivalry stated as a problem and would compromise impartiality.
Western	Justin Smallwood	The West Regional Rowing Council (WRRC) is the youngest in the ARA having been in existence since 2001. The large geographical area, encompassing all of Devon and Cornwall, combined with the various types of rowing that takes place in the South West make this region rather unique. The region supports nearly 8000 rowers who are represented by various different Associations. These are; Cornish Pilot Gig Association, West of England Amateur Rowing Association, Seine Boat Group, Isles of Scilly Gig Association and Cornish Rowing Association.	Because of the large distances involved between clubs the RWSA felt that he required more support in that he was unable to visit clubs in support of the audit process enough.
BUSA	Nigel Maygothling	British University Rowing is the main point of contact and organising body for university rowing within Great Britain. It is part of the wider British University Sports Association, however the majority of events and activity apply on the whole ARA rules. Geographically it covers all the devolved regions, however the majority of activity actually resides within the standard club structure, i.e. Salford University rows from Agecroft Boathouse and as such the members are subject to a dual level of control namely from BUSA and the individual club and ARA.	Coxes – responsible for checking lifejacket; share local coxing knowledge Novice – safety brief for novice "confidence to stay afloat" – stay with your boat WSC – BUSA observe safety – too many pages, no one reads it – displayed in every club. Incidents – huge amount of under-reporting, but could be a useful tool. Every University will have someone in charge of safety with the university - either in SU or university/department.
CARA	Phil Challen	CARA is the governing body for coastal rowing clubs wishing to promote or compete in the South East of England. There are currently ten rowing clubs affiliated to the association.	CARA clubs had very well developed risk assessments and were the only area where there were specific winter risk assessments where different regulations were applied to activity during the winter months. Within CARA the annual club audit was also supported by Regional Safety Adviser visits whereby every club is visited once in a 3-year period.

6.4 Review of the ARA water safety system

In this section we focused on the existence of formal risk management policies, procedure and statements of responsibility and intent. In particular we looked for:

- A clear organisation, wide vision, with specific commitments to managing risk.
- A specific plan of action with clear responsibilities to engender a 'safety culture'.
- Supporting documentation to assist communication and development at the various levels required enabling the culture to exist.
- Evidence of a robust 'safety system'.

In reviewing the documentation, and the systems applied to manage risk to ARA members, it is important to acknowledge a number of key factors that are particular to the ARA, and sporting NGBs in general;

The limitations inherent with any volunteer-led sport needs to be acknowledged when considering the effective scope of the risk management system applied.

The voluntary nature of rowing, its governance structure is a key strength and one of the main reasons for the sport's continued existence. However, the corporate structure of the ARA, especially the reliance on volunteers to both manage and deliver ARA objectives, inherently places limits on the ability to direct the actions of its members when considered in the context of any risk management system. In essence, the point in question when considering the systems and underpinning documentation in place is:

'How far can the ARA actually direct and control the actions of its members?'

The effective application of any risk management system is limited by the ability of any organisation to control the actions of its employees. Ultimately in a work environment, the final sanction is to remove the employee from the workplace. The ability of the ARA to limit a club or individual from taking part in rowing is untested. The fact that the majority of key players within the safety system are volunteers fundamentally changes the approach (and arguably the level of effective control) the ARA have available to them within this system. This issue common to all sports NGBs and it should be noted that rowing is arguably in a stronger position than many of it peers, owing to the fact that the majority of the activity is taking part within an ARA club, by ARA members or to their rules.

Our subsequent analysis of the documentation and systems approach is with due consideration given to the constraints placed upon a voluntary activity. To this end we examine the system in place and the key existing documentation supporting this; the Water Safety Strategy and Water Safety Code. Following discussion with the water safety working group, we offer brief comments with respect to 'Row Safe'. In particular we looked at three key documents:

- Water Safety Strategy
- Water Safety Code
- Duty of Care and Responsibilities (Online version)

It is worth reiterating that in this aspect of the review we focused on determining the existence and quality of the 'safety system' as opposed to its actual implementation, which is covered in the observed practice /interview and key findings section.

The ARA water safety system

It is immediately apparent that the ARA has a systematic approach to managing water safety risks. This follows standard models for managing occupational risks. The POPIMAR (Policy, Organising, Planning & Implementing, Audit & Review) model is widely used to manage occupational health and safety. There are a number of variants on this model in use, however they all cover the broad areas illustrated below.

The POPIMAR model, as applied to a risk management context.

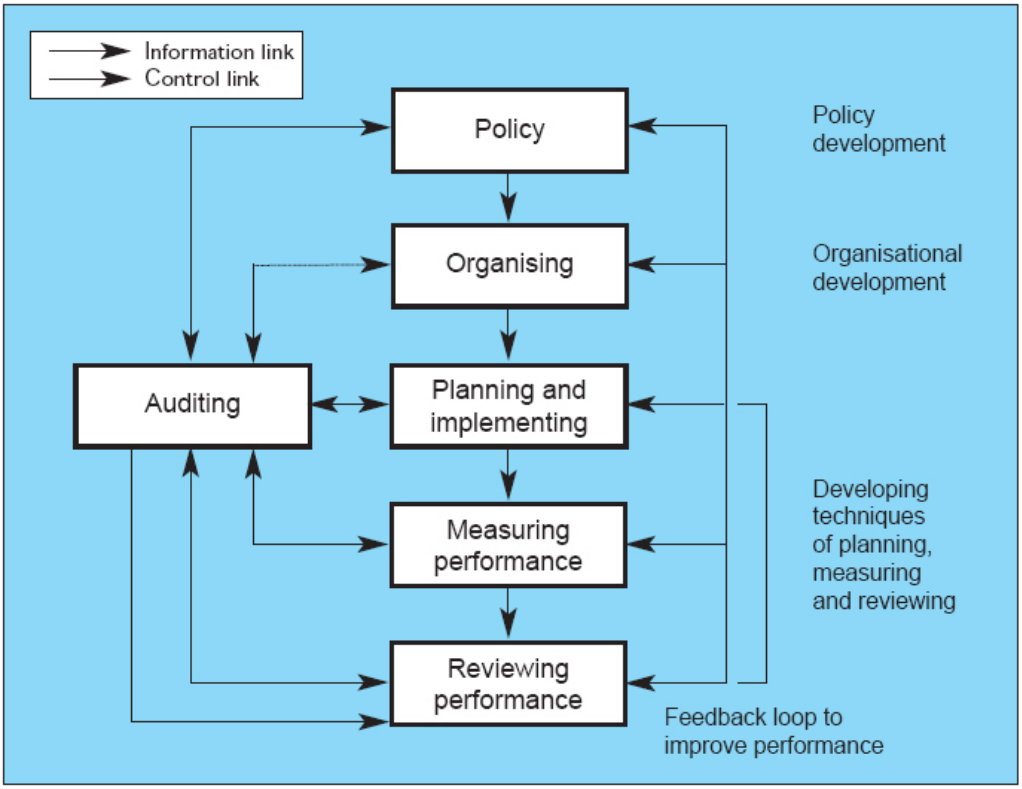


Diagram taken from: Successful Health and Safety Management, HSE Books

The ARA water safety system is developed upon the POPIMAR model, as given in HSG 65. There are a number of key facets of this model that require development. In terms of documentation, the policy and organising modules can be best evidenced in the ARA water safety code and strategy documents. In assessing the existence and quality of system in place, we have attempted to evidence and evaluate the above areas as an indication of a 'safety system' and 'positive safety culture'. As such the evidence is presented under the following headers:

- Policy
- Organising
- Planning & Implementing
- Measuring
- Auditing and Reviewing

It is worth stressing that in this aspect of the review, our objective was **only to establish the existence and quality of system in place,** as opposed to the actual application on the ground.

Policy

The ARA WS strategy document makes a number of overt statements asserting its responsibility for safety and its vision for establish a culture of safe practice. To this end the ARA should be commended. In particular the document states:

"The ARA is the NGB for rowing in England and GB international rowing…Part of its role has been the development and setting of rules and guidance for water safety for the sport."- (Pg 1,Para 4, WS strategy)

The overall ARA aim of the WS strategy is to:

"*To develop a culture of safe practice throughout the sport and to support everyone at all levels who is involved in rowing in their responsibility for safety'.*
(Pg 4, Para 6, WS Strategy)

Within the Water Safety Code there is also a clear statement recognising the risks associated with rowing:

"Rowing and sculling are by their nature, outdoor activities and as such subject to the vagaries of the weather in all its forms. It is important to recognise that contending with difficult weather conditions is part of the sport. Safe enjoyment is the aim, not foolhardiness" (Pg 6, Para 2)

The position document *'Duty of care and responsibility'* states in more detail what the ARA expect the individual to be able to do in order to participate in a safe manner:

"All participants in rowing and sculling, including coxswains, should receive proper instruction in watermanship and technique, including capsize drills, from a qualified coach so that no person puts themselves or others at risk when on the water. Junior members and beginners should receive particular attention. Every encouragement should be given to athletes and coaches and Safety Advisers to become fully conversant with life saving and resuscitation techniques through practice and by attendance at ARA and other recognised training courses." [3]

When taken together these statements are important because they clearly assert a commitment to the culture of safe practice, the ARA ownership of standards setting, guidance, rules and control, in addition to (partially) acknowledging the risks associated with the activity, as policy statements.

However, it is unclear from the documentation to what extent ownership of some of these statements are held by the ARA executive or national council, or if it simply resides within the water safety working group.

Omissions:
Executive and National Council level ownership of the key statements is required.

Possible improvements:

- A single clear document stating the vision and commitments
- A wider all encompassing statement acknowledging the risks

[3] Duty of care & responsibilities: www.ara-rowing.org/render.aspx?siteID=1&navIDs=1,249,254 (Accessed May 07)

Organising

The establishment of clear procedure and responsibilities is critical to ensure that appropriate action is taken to manage the risks. In an ideal situation there should be evidence of three levels of 'risk managers', namely policy makers, planners and implementers. In addition to these there is also the safety advisor who has specific knowledge and skills enough to assist at each level. To this end we have presented our findings at three levels, national, regional and club.

National roles and responsibilities

The highest level control within the ARA rests with the National Council, and the supporting Executive. Accountable to the National Council are a number of committees and working groups. The key groups relevant to this review are the Water Safety Committee and Water Safety Sub Group. The WSC states that the ARA duty is to ensure:

- *That it provides guidance and rules to ensure a safe background to the sport*
- *That it monitors incidents and accidents to highlight trends, dangerous situations and practice.*
- *That it provides advice and rules based upon its finding. That it educates clubs and membership to provide a safer environment*

  (Section 2.7.2 WSC)

Water safety committee

The water safety committee consists of the regional advisors and is chaired by the Honorary Water Safety Advisor.

Regional roles and responsibilities

The highest level responsibility at this level rests with the Regional Rowing Council (RRC), this is best evidenced within the online document '*Duty of care and responsibilities*' in which the RRC has a stated duty to:

- Monitor safety in their regions and act on unsafe practices
- Provide advice and support on safety issues the their member clubs
- Help clubs to assess risk and audit their compliance with the code

Regional Water Safety Advisors

Regional water safety advisors are in place. The role is unpaid and undertaken in a voluntary capacity. In brief, our understanding of the role is to assist and ensure club compliance with the WSC, ensure that the annual audit is returned, and provide clubs with ongoing assistance on specific issues such as identifying key areas of risk. Under those terms stated within the WSC the regional advisor (as the most likely actor) is enabled to do the following:

"Inspection of arrangements and facilities may be made from time to time by appointees of the relevant Regional Rowing Council and / or representatives of the ARA who shall be entitled to impose in writing corrective measures or suspensions of activity whenever appropriate."

(Pg 4, Para 1.10*)*

The role of the regional advisor was last defined in February 2004, by the WSC. There are 15 key areas that the job description requires from the regional water safety advisor, for ease of reference we have split the requirements into four broad areas:

Guidance & Support

- Be fully conversant with the Water Safety Code and guidance notes
- Assist with risk management where requested
- Give feedback and / or advice on incidents
- Give feedback on Safety Plans for events
- Promote safety training within the region

Coordination & Communication

- Facilitate contacts with local river users groups or similar bodies to assist understanding and resolve areas of conflict between users
- Facilitate contact between clubs and local navigation or other relevant water authority relating to local water or weather conditions
- Disseminate good practice
- Develop contacts with Club Water Safety Advisers
- Establish and maintain contact with the National Water Safety Adviser

Monitoring & Control

- Advise Club Officers where unsafe practices are seen to be taking place
- Exercise authority, in conjunction with the Regional & Club Officers, to suspend boating activities where seen to be unsafe

Reporting

- Report to Regional Council meetings
- Receive and act upon the Annual Club Safety Audit return
- Produce an Annual Safety Report for the Region

(Unpublished document)

Club roles and responsibilities
There are several key roles within the club environment pertaining to the management of safety. Quite rightly the ARA WSC asserts that the key responsibility rests with the individual rower, and that the education of every rower coach and in particular juniors, is important and that they should receive training in watermanship and techniques including capsize (2.5.1 WSC).

The individual
The WSC states that all individuals on the water are responsible for their own actions, and they must be able to swim to a defined standard. (WSC 2.5 – 2.5.2.2).

In particular the WSC recommends that all active members should learn and practise capsize drills, particularly juniors (2.5.2.8).

The steersmen
The steersman is responsible for both the boat and the crew members. They should be able to navigate the boat safely, be conversant with rescue and emergency situation arrangements, and be aware of the key risks to the crew and others. (WSC 2.5.3)

The coach
The coach not only concerned to coach his crews, but has an underlying responsibility for their safety whilst in his/her charge (WSC 2.5.4.1). The ARA coaching scheme ‘strongly advises’ members to obtain a coaching qualification.
It is the coaches responsibility to assess the planned activity, allowing for the age, ability of the participants and the water / weather conditions. It is also their duty to

ensure that every athlete under their charge understands the safety plan (WSC 2.5.4.2.). Further to this the coach shall ensure that:

The crew is suitable dressed for the conditions, that they operated on water within their capabilities, that appropriate lifejackets or buoyancy aids are worn by the launch crews, that the launch crews use kills cords and carry an appropriate safety kit. (WSC 2.5.4.3 - 7).

The exact number of rowers under the coaches charge is not specified by the WSC, rather an indication of good practise is given.

Measuring Performance

In order to monitor performance to identify strengths and weaknesses, and areas for improvement, an organisation needs to operate systems to collect relevant data and statistics. This will also provide crucial information for planning and reviewing activities.

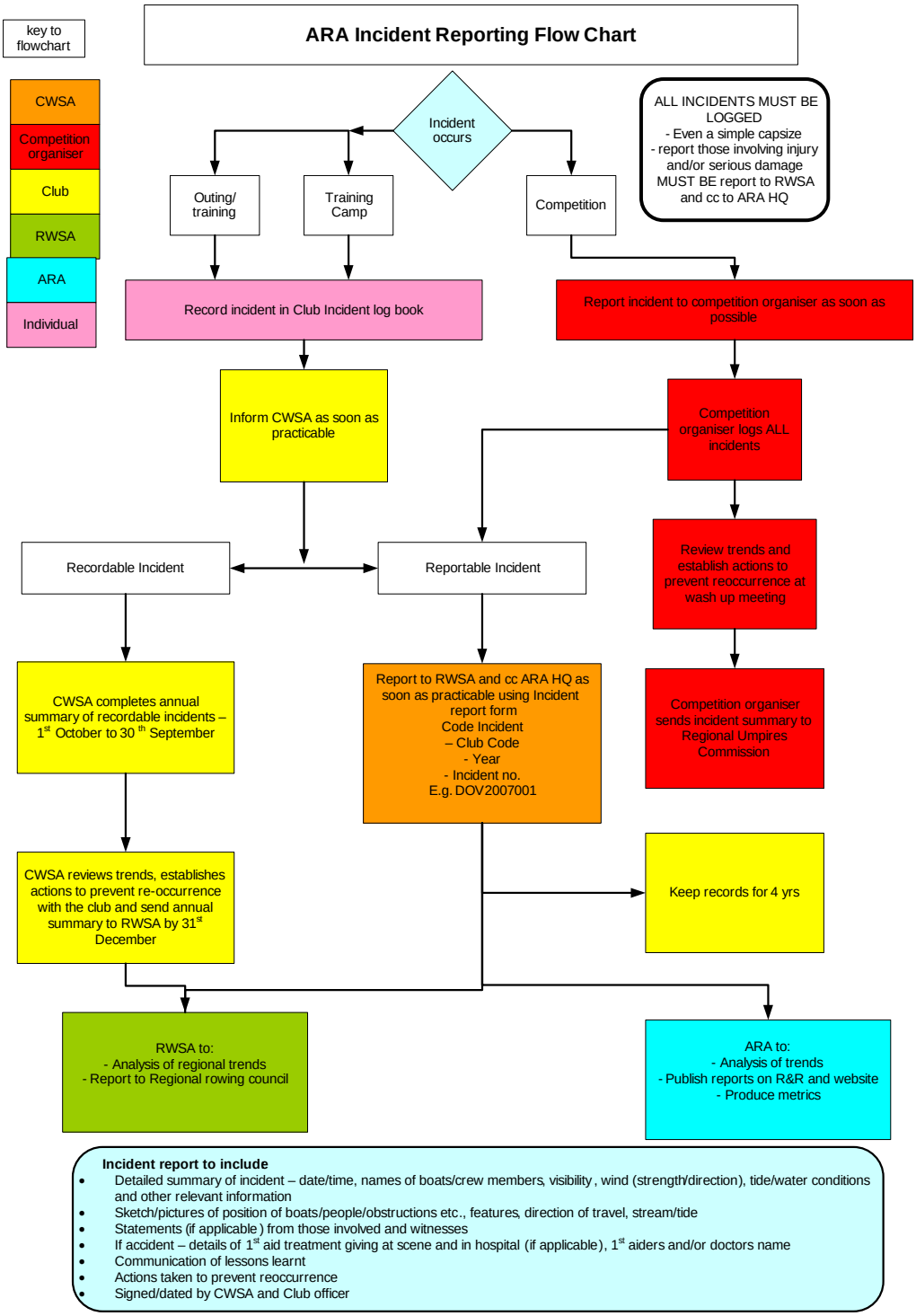
The ARA relies on a self-auditing system and reporting system within its clubs, whereby club water safety advisers answer a set questionnaire relating to the implementation of ARA safety guidelines in their club. This system, while determining what the clubs say they do, does not provide any evidence for what actually is happening in the club. It also is unable to recognise club members' understanding of safety issues and competence in implementing safety.

Incident reporting

Incidents are recorded by clubs as either recordable or reportable incidents, depending on severity. These incidents are recorded in an ARA incident book that is mandatory for the rowing clubs. The information gathered in incident reporting logbooks are open to varying degrees of information being recorded as the booklet does not state the need for any specific details. Outside of a small 'Brief description' box that leaves it open to the describer, the only information asked for is an incident number, date of incident, date of report sent, and who the report was compiled by. There is no recording of reasoning behind why the incident happened or which boat was involved. This incident recording system does not collect detail necessary to assist in reviewing and determining safety in rowing.

Incidents are passed on to Regional Water Safety Advisors who collect them for the ARA, who may or may not act on them. They are not formulated into an incident database that is useful for clubs to learn from.

Flowchart of ARA incident reporting system



Although there is a clear reporting structure in place, the format of the currently captured data does not allow this data to be turned into useful, objective information. Crucially, allowing the wide degree of variance given by the 'text box' approach means that standard reporting is undermined. Currently the ARA cannot say with this system, if they have a particular issue with (for example) a certain type of boat, location or specific problem, due to the lack of standardised terms in reporting.

A simple fix for this would be to 'close down' as many fields as possible, moving the reporting system to a closed field approach (i.e. the reporter is limited to a range of choices). This, in addition to a text box specifically for the 'causes and background activity' to the incident will quickly enable the ARA to better analyse the information submitted.

If this is established, in the longer term, the setting of overall performance indicators can be established. This will enable an injury surveillance system to be realised. It is worth noting that other NGBs such as the BMC are adopting this approach. The current position of the ARA is in line with the majority of water sports organisations save the British Sub-Aqua club. We are aware that the ARA is already addressing this situation.

Audit & Review

The ARA relies on annual self-auditing of its clubs, whereby club water safety advisers answer a set questionnaire relating to the implementation of ARA safety guidelines in their club. This system, while determining what the clubs say they do, does not provide any evidence for what actually is happening. It also is unable to recognise club members' understanding of safety issues and competence in implementing safety.

As with any management activity, to be successful the scope of safety management reviews must be pre-planned. This requires the establishment of a number of key performance indicators and a review schedule, which is communicated down to club level. This plan should aim to ensure that all policies and procedures and their practical implementation is systematically covered over a few years. The initial appraisal of each topic should take place at club level and be upwardly cascaded to the ARA for their overview and decision-making, which will take into account information on safety management and good practice. At each level 'local' remedial or enhancement actions should be identified and action plans implemented.

Currently there are no performance indicators for clubs. However, within the Row Safe scheme the introduction of minimum and desirable performance standards is key to enable the clubs to have an aspiring approach in addition to the central water safety team being able to identify where the ARAs criteria are being met at each level. This immediately sets performance indicators for those tasked with running the risk management system to work towards.

Within clubs themselves, reviews seemed to be undertaken to a certain extent at committee meetings and information dissemination often through a notice-board, newsletter or website. This activity is in excess of what the current system would demand.

SWOT analysis of the ARA water safety system

Strengths	Weakness
Comprehensive, standard system. Ownership within the Water Safety Committee. Group able to audit gaps in system, and plan for future. Well skilled, committed 'steering group' overseeing system. Well recognised ' WSC' document. WS Committee has action plan in place as is already addressing many issues highlighted.	Policy and guidance not always clear and fully enforceable. Incident data, not sufficient to identify risks with enough detail. Performance indicators not fully in place. Greater need for prioritisation of future tasks. 'Laissez-faire' approach to standard setting, with respect to safety element. Current version of WSC is not goal setting, nor does it always distinguish between a desirable standard and a compliance standard.
Opportunities	**Threats**
Revision of Code already well under way. Due for publication Dec. 07. Competence of those with devolved responsibility (ie. Coaches / CDOs / Club WSA) can be improved quickly with support.	Unclear support from Council & Executive. (This may be simply to do with communication of support) Responsibility for delivery requires further clarification. Communication needs to be improved. Perception of 'safety' responsibility resting with a few key individuals. Inability or unwillingness to actively 'take on' and influence boat builders. The lack of a trade body and single point of contact with equipment suppliers

Comment upon the Water Safety Code

The ARA Water Safety Code was first introduced in 1984, and at the time was a world first for the sport of rowing. The code has been redrafted twice, in 1994 and 2003, to reflect changes in the sport and approaches to risk management. The code has always been the single central vehicle for promoting safe practice in the sport.

The current WSC's key strength is the complete distribution among clubs, and its wide recognition within those clubs. The development of the code since its inception in 1984 has meant that it has, during revision, taken on a lot of additional technical information but has not fully moved forward from a document of rules and regulations.

The fact that it has been found not to meet the needs of either the individual rower or club officer, stems from the requirement of the various people (WSA / CWSA /Club member) who use the document as both a reference source, guidance document and enforcement tool. Like the Highway Code, it contained all of the necessary information but was not packaged in either a user friendly or specific audience targeted manner.

The revised code encompasses a much wider range of activity, including the off water risks associated with rowing. The proposed system within the 'Row Safe' scheme addresses the majority of the shortfalls with the current code, and should cement the ARA's transition from rule setting to a goal -based risk management approach.

The code's weakest point was its inability to communicate key messages to the right individuals. It can be argued that this was indicative of the mixed objectives for the code itself. From our observations and discussions with those involved with managing the risks within the sport, the changes to underlying systems and approach that are already under way 'should' ensure that future manifestation of the code (e.g. Row Safe) is robust enough to meet the challenge.

The commitment of the regional advisors, and those charged with managing risk within the sport is undoubted. However, because of the demands of each region being different, the scale and workload involved in the roles meant that the advisors could not effectively meet all the requirements of the job description.

Hypothermia and capsize

Useful guidance is produced by the ARA though not specifically targeted at the individual rower, coach or safety adviser. Most clubs provided the opportunity for swimming pool-based capsize drills, with a few actually requiring all rowers to carryout such training on a regular basis, with others as long as it was done once. No clubs did open water drills or tests, and cold water immersion practice was not carried out by any clubs.

Very few clubs varied their formal rules for summer or winter water temperatures but provided some ARA guidance for cold water and hypothermia. Eton College and the management of Dorney Lake were very proactive in their management of water temperature and possible exposure to cold water. They operated a one degree one minute rule developed by Rowing Canada where a ratio of temperature to survival in water was used to advise rowers and determine response time for coaches and or rescue craft.

Attitude was broadly felt to depend upon the individual rower (if an adult) and varied with level of experience the rower had from beginner/novice up to veterans.

Other water sports auditing and accreditation schemes

The ARA is among a few similar organisations that provide accreditation schemes for training centres and clubs. Accreditation schemes of the BCU and the RYA were compared with those of the ARA to determine if there were any significant differences in the way they are managed.

BCU Accreditation Schemes

The BCU Top Club Scheme and Accredited Centres scheme provide assurance of high standards of safety and qualified instruction. The Accredited Centre Scheme ensures that equipment and facilities in centres are approved annually, after satisfying approval officers. The Top Club Scheme aligns with Sport England's Clubmark criteria as well as meeting the needs of BCU clubs and paddlesport. Clubs are accredited by activity programme, coaching, duty of care and ethics, and club management, and these are reviewed every year. Paddlesport Development Officers visit the clubs to support them in the accreditation process and to inspect whether minimum development criteria have been met.

RYA Recognised Training Centres

RYA recognised training centres are part of the RYA and have access to services and resources available to members. This includes employment law, planning and child protection. Courses run at an accredited centre can provide RYA certificates and publications. The accreditation scheme offers the use of the RYA 'tick mark' logo that represents high standards of safety including annual inspection and safety checks.

ARA Accreditation

The club accreditation scheme offered by the ARA is integrated with Sport England's Clubmark Accreditation scheme the National Junior Rowing Programme Go-Row Accreditation provides acknowledgment of child protection and safety, quality coaching, equal opportunities and good management. For clubs in this scheme the ARA has produced resources, improved the effectiveness of the modular Coaching Award Scheme and places professional Coaching Development Officers in all areas of England. The accreditation portrays that clubs have a safe, effective and child-friendly environment. ARA also run an accreditation scheme for indoor rowing schools that ensures appropriate standards are maintained through visits of ARA Coaching and Development Officers that are carried out annually.

6.5 Data Collection

ARA

The ARA collects data annually from member clubs in the form of a club water safety audit that the club water safety advisor completes. This data contains information regarding each club's safety management. It determines if safety procedures advised in the ARA Water Safety Code are being implemented in clubs and to what extent. The ARA collects reportable incidents by having them passed from clubs to Regional Water Safety Advisors.

Clubs

Rowing clubs collect data on their members and on incidents to varying degrees, some more than others. The clubs hold an incident log that the ARA makes mandatory, in which they record both recordable and reportable incidents in the format specified. The detail recorded in incident books varies according to the descriptions of those recording them.

RoSPA

RoSPA collates drowning statistics for the UK. These were searched for rowing fatalities over the years 1989-2006. The only fatalities determined were those of Sikander Farooq and the drowning abroad of Leo Blockley; there were no further recorded deaths. RoSPA viewed ARA club water safety audits for 2006-7 of clubs that they interviewed and audited and looked at club risk assessments and water safety policies where clubs were happy to provide these.

7.0 Boat Buoyancy

This has been written after consultation with the following: -

- FISA
- ARA
- Competition rowing boat builders
- Representative from the Southampton Rowing Club
- The convenor of ISO TC 188 WG 22 – Stability and buoyancy

A comprehensive literature review has also been undertaken.

7.1 Analysis of buoyancy

Buoyancy is the force generated when a body displaces a volume of water. Archimedes demonstrated that the mass of water displaced by a freely floating solid object exactly equals the mass of that object. A block of wood floats because it has a density less than that of water. Its available buoyancy exceeds its mass. A solid steel object sinks because it has a density greater than water. Its available buoyancy is less than its mass. So with a solid object, its density, i.e. its mass ÷ volume, will dictate whether it floats or sinks. The density of fresh water is 1000 kg/m^3. So a solid object with a mass of 1000 kg and a volume of 1.1 m^3 will float (1000 ÷ 1.1 = 909 kg/m^3) whereas if its volume was 0.9m^3, it would sink (1 ÷ 0.9 = 1.11 kg/m^3).

With a hollow object the density of the hollow part, as well as the solid part, also needs to be considered. What matters is the average density (total mass ÷ total volume). An enclosed steel box will float provided the average density of the box including the air inside is less than the density of water. This is why steel ships float. The density of steel is about 7800 kg/m^3 whereas the density of air is about 1.25 kg/m^3. So if the steel sides were 0.01 m (1 cm) thick and the box was a 1 m cube then the approximate calculation of its density would be: -

Volume of the 6 sides = 6 * 1 m * 1 m * 0.01 m = 0.06 m^3
Mass of the 6 sides = volume of the 6 sides * density of steel = 0.06 m^3 * 7800 kg/m^3 = 468 kg
Approx volume of air = 1 m^3
Approx mass of air = 1 m^3 * 1.25 kg/m^3 = 1.25 kg

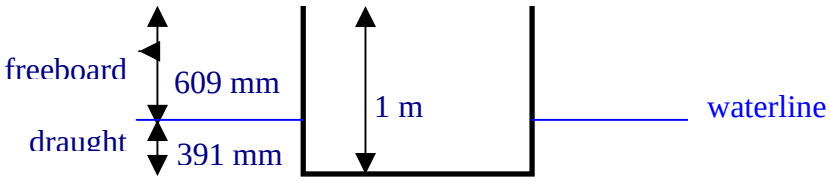
Total volume = 1 m^3
Total mass = 468 kg (sides) + 1.25 kg (air inside) = 469.25 kg
Density of total box = 469.25 kg ÷ 1m^3 = 469.25 kg/m^3

So the box, sides and air inside, with combined density of 469.25 kg/m^3 will float, as the density is less than the density of water at 1000 kg/m^3. As the box floats the mass of water it displaces is equal to its own mass of 469.25 kg.

The same box, provided water does not enter the air void inside, will still float even if its top is removed.

Mass of the 5 sides = volume of the 5 sides * density of steel = 0.05 m^3 * 7800 kg/m^3 = 390 kg. The mass of the air inside is still 1.25 kg so the floating open box will displace 391.25 kg of water. The volume of 390 kg of water (391.25 kg ÷ 1000 kg/m^3) = 0.39125 m^3. So, ignoring any stability problems, the box will float with the waterline approximately 391 mm (0.391 m) up from its bottom. The distance from the bottom of the box to the waterline is called the draught and the distance from the waterline to the top of the box is called the freeboard. The water it displaces has a mass of 391.25 kg. The volume of the box above the waterline is called its reserve buoyancy.

Diagram 1:



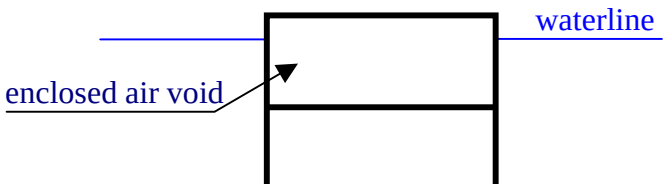
In examples of this type the mass of the air, being only a small portion of the total mass, can be ignored. This is the case in all of following examples.

A box, or a boat, with these characteristics is buoyant so long as the water is kept out of the interior. If water enters the box, through say rain or a wave breaking over the side, i.e. it is swamped or flooded, then the total mass will increase by the mass of the water inside and the box will float lower in the water. If water continues to enter the box then there will come a time when the total combined mass of the steel box and the water inside will give an average density greater than that of water alone and the box will sink.

A conventional way to ensure water does not enter the interior in sufficient quantity to sink a boat is to enclose the boat, or parts of the boat, so as to make it rather like the totally enclosed, 6 sided, box. By putting the lid back on the box the mass is increased by the mass of the lid i.e. one side (78 kg) and the box will accordingly float lower in the water but it will not, unless holed, sink. Another way to avoid water entering the interior is to ensure that the boat has sufficient stability and freeboard that the probability of the boat capsizing or of water entering over the sides is remote. If the freeboard is insufficient then there is a risk that the boat will sink unless some other preventative measure is taken.

If the bottom half of the box is enclosed even if the other half is completely swamped with water, 0.5 m^3 of water will still be kept from entering the enclosed part of the interior. The box will have the same mass of 469.25 kg but its average density will now be 938.5 kg/m^3 (469.25 kg ÷ 0.5 m^3 = 938.5 kg/m^3). The stability of the box will probably mean it will turn over or capsize (as shown in Diagram 2) but, provided the enclosed bottom is not holed, it will still float.

Diagram 2:



A box or boat of this type is said to be buoyant when swamped. That is to say, in the intact (not holed) condition it has sufficient available buoyancy owing to its materials and its physical shape and configuration including any *buoyancy or flotation elements* such as enclosed air tanks to enable it to float when swamped. The volume of buoyancy is greater than its volume of displacement (mass). The mass of a floating body is often called its displacement because it displaces its own mass of water.

If a boat is built of materials that on average are less dense than water, it is said to be inherently buoyant.

Both of the above examples relate to static buoyancy i.e. no movement of water or boat, and take no account of stability. In reality both boxes, open and closed, will float with a tilt, list or loll to one side.

7.2 Freeboard

The ability of the open steel box (as shown in Diagram 1 above) to float is also dependent on the height of its sides above the waterline i.e. its freeboard. If the vertical sides of the box were only 400 mm then its reserve of buoyancy would be very much less to the extent that a wave of only 10 mm would exceed the 9 mm height of the freeboard and water would enter the inside or interior of the box. Once water is inside, the combined mass of the box and water increases so that the box floats lower in the water and its freeboard is reduced. If water continues to enter the box then it will soon have no freeboard and no reserve, the combined mass of the box and its enclosed water will exceed the mass of an equal volume of water and so it will sink.

7.3 Down flooding point

The lowest point of the freeboard in an open boat is called the down flooding point. This is the point at which water will first enter the interior of the boat if it becomes continually lower in the water through the ingress of water or the addition of load. It is also a gauge of the height of waves that would to start to swamp the boat *over the side*.

7.4 What are the buoyancy hazards?

The basic hazard related to buoyancy is that the boat might sink. Initially this always involves the boat filling with water because of:

- Sudden swamping by waves, perhaps because of overloading or from the wash of another boat.
- Swamping as a result of heeling, perhaps because of an offset load or a lack of stability.
- Slow swamping through submerged openings, hull damage or leaks through hull fittings.

It will sink if it:

- Is not built of buoyant materials, or
- Has insufficient flotation, or
- Has leaky flotation tanks or water-sodden foam flotation

7.5 Buoyancy analysis of a sample competition rowing eight

For the purpose of this review and within the constraints of time, analysis of competition rowing boat buoyancy has been restricted to the analysis of a sample eight. The findings related to an eight are likely to be the *worst case* of eights and fours and so, if applied to fours, will give as good or better results. All conditions are given for fresh water only.

The sample eight parameters used for the analysis were generally as listed below: -

Aft Cox		
LOA -------	17.03 m	
Max beam	0.6 m	
Max depth	0.38 m (to sax board)	
Hull -------	weight 96 kg	Density f.r.p 1500 kg/m3 -
-------		Density wood 600 kg/m^3
Oar weight	24 kg (3 kg x 8)	Density taken to be 1000 kg/m^3
Crew weight	700 kg (8 x 87.5 kg)	Density taken to be 1000 kg/m^3
Cox weight	60 kg	Density taken to be 1000 kg/m^3
Extras------	20 kg	Density taken to be 1000 kg/m^3
Total -------	900 kg	

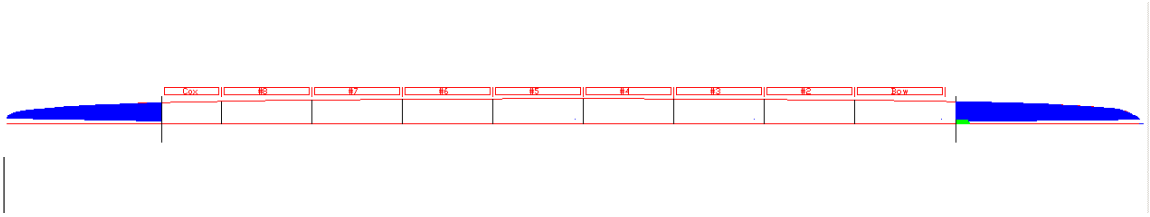
Length for 7 oarsmen	1.36 m each
Length for bowman	1.52 m
Length for cox	0.9 m
Enclosed bow air tank length	2.76 m
Enclosed stern air tank length	2.33 m

Distance from outside skin CL to top of crew seat = 235 mm

Centre of Gravity of crewman from seat (in pulling position) = 0.4 m (calculated using IMO standards)

Figure 1 shows the profile body of the inverted sample eight with bow to the right. The blue areas are the enclosed bow and stern air tanks.

Figure 1:



Note: There are virtually no measurement rules controlling the construction of competition rowing boats. Accordingly the sample eight used for the analysis was chosen as being typical of eights in common use. For flotation calculations, two hull materials have been considered - f.r.p and wood.

The analysis was undertaken with hull shapes taken from an AutoCAD lines drawing of the sample eight and processed using the Southampton University Wolfson Unit for Marine Technology and Industrial Aerodynamics ships hydrostatic stability software. This software enables the measurement of the various volumes of a boat at different levels of flooding.

In the calculations the density of crew has been taken to be the same as water and no account has been included for variations in stability or longitudinal trim. Hull structures are also assumed to have a density the same as water except when otherwise stated.

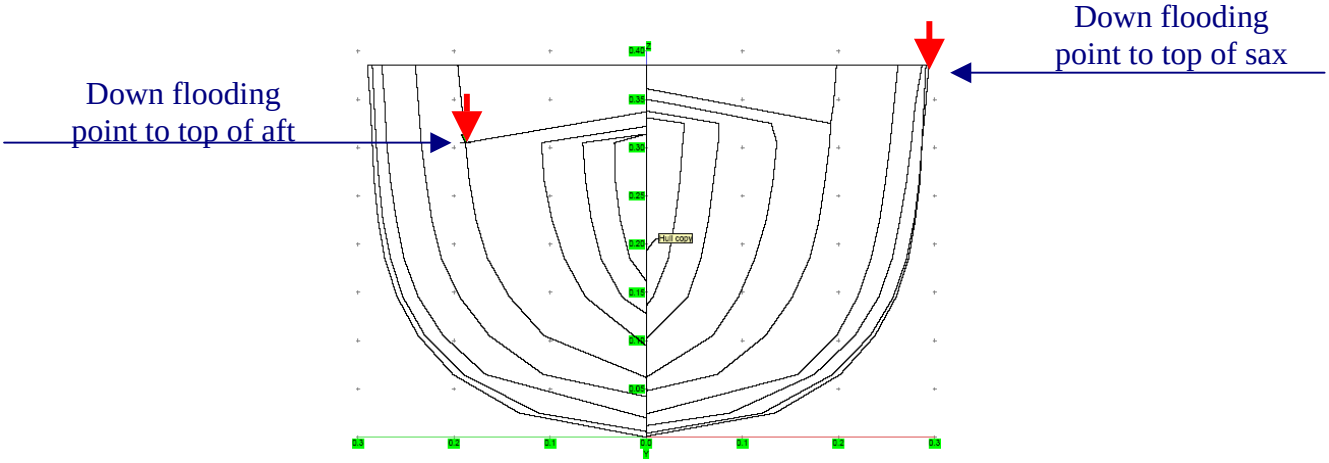
- In the upright swamp floating condition only a small volume of each crewmember will be immersed and these volumes will have a density about the same as water (body fat = 918 kg/m^3, bone =1600 kg/m^3).
- No effects of stability have been included nor the effects of trim change due to flooding. Eights tend to trim down by the stern when flooded but the amount is small and owing to the length:beam ratios of the boat and proportion of crew mass (which move fore and aft) to hull mass, it is difficult to calculate trim with any certainty.
- Some eight hulls or parts of eight hulls are constructed from wood with a density less than water whereas others are moulded using resins and fibres (f.r.p.) having a density greater than water.

7.6 Sample eight down flooding points

The upper portion of the topsides of competition rowing boats is called the sax board. This is an equivalent structure to a carlin or coaming around the top of a cockpit in a larger boat. The sax board runs the full length of the crew cockpit and so, athwart ships, the height of the top of the sax board above the water will also be the height of the down flooding point. Conventionally the sax board continues around the front of the crew cockpit frequently in a *breakwater* or *washboard* configuration and with a height no less than along the sides. However the sax board is often omitted from around the aft end of the crew cockpit. In some cases this is done to enable shipped water to be *ejected* from the interior of the hull via a *ramp* fitted at the aft end of the cockpit from the floor to the top of the aft deck. As the boat is pulled forward the swamped water will surge aft, up the ramp and overboard.

The omission of the sax board from the aft end of the cockpit lowers the down flooding point by the height of the sax board. With the sample eight this is some 75 mm. To illustrate the effect of this the hydrostatic analysis, has been undertaken during swamping showing the effect for each down flooding point. Figure 2 illustrates hull sections showing the two different down flooding points.

Figure 2:



The analysis was undertaken to determine:

- The volumes of the three main parts of the hull - forward and aft air tanks and centre crew cockpit
- Intact swamped draughts / freeboard to the two down flooding points
- Amount of extra floatation needed to pass FISA rule 31, 1.11 as detailed in 4.1 above
- Amount of extra floatation needed to obtain other freeboards

The analysis was undertaken in the loaded condition. The top of the sax board was taken amidships

7.7 Results of analysis

Three situations are considered: -

- During swamping - when the boat is being swamped by waves over the side
- Swamped equilibrium - when the boat finds swamped equilibrium
- With added flotation

Table 1: Hull volumes excluding internal structures and seats.

Volumes	**m^3**
Aft enclosed air tank compartment	0.077
Open volume of crew cockpit to aft deck down flooding point	1.506
Open volume of crew cockpit to top of sax board	1.987
Forward enclosed air tank compartment	0.112

7.7.1 Results of analysis - During swamping

Table 2 gives the volumes of water in the cockpit and the freeboard to aft deck and sax board for various swamped conditions measured as the depth of water in the cockpit. A fuller tabulation of swamped volumes against swamped depth is given in Appendix 7.

Table 2:

Case	Approx depth of water in the hull (mm)	Approx volume of water in the hull (m^3)	Approx volume of water in the hull (litres)	Approx draught midship (mm)	Freeboard to midships sax board down flooding point (mm)	Freeboard to aft deck down flooding point (mm)	Swamped mass (Kg)
1	0	0.00	0.00	182	203	128	900
2	50	0.073	73	192	193	118	973
3	100	0.276	276	219	166	91	1176
4	150	0.538	538	253	132	57	1438
5	200	0.827	827	291	94	19	1727
6	225	0.978	978	310	75	0	1878
7	250	1.131	1131	330	55	-20	2031
8	300	1.443	1443	383	2	-73	2343
9	350	1.760	1760	Sunk		-75	2660

Case 1 shows the situation with no water in the hull.

Case 6 shows the situation when the volume of water inside the hull is such that the freeboard to the aft deck down flooding point has reached zero. At this stage, should there be no sax board across the aft end of the cockpit; water would start to flow freely into the hull via the down flooding point until swamped equilibrium is reached or the boat sinks.

Case 9 shows the situation when the volume of water inside the hull is such that the freeboard to the midships sax board down flooding point has reached zero. At this stage, should a sax board be fitted across the aft end of the cockpit; water would start to flow freely into the hull via the down flooding point until swamped equilibrium is reached or the boat sinks.

It is noteworthy that although the vertical height between the two assumed down flooding points is 75 mm, the difference in flooded depth between Case 6 and Case 9 is 125 mm.

In reality, as the boat swamps a portion of the crew will become submerged, particularly the cox. This will increase the depth of water in the boat for the same, given volume of water but the amount is small as the submerged parts of the crew are small. The worst case would be with no part of the crew submerged and so, for this part of the analysis the effect of submerged crew has been ignored.

7.7.2 Results of analysis - Swamped equilibrium

With no freeboard, water will flow freely into the crew cockpit until swamped equilibrium is reached or the boat sinks. Swamped equilibrium is the case when, provided the boat and load remains afloat, the volumes of buoyancy equal the volumes of displacement (mass). To illustrate the likely variations in results through different boat construction this part of the analysis has been undertaken including both f.r.p and wooden hulls.

Volumes of displacement (mass) -
For the boat to float with crew the volume of displacement needs to be = 900 kg / 1000 kg/m^3 = 0.9 m^3

Volumes of buoyancy -
Volumes of buoyancy for the individual underwater parts of the boat may be calculated from their mass and density as: -

$V = m/\rho$

Where

V = volume
m = mass
ρ = density

Volumes for the individual submerged elements of the boat (the complete hull is assumed to be submerged).

the buoyant air tank ends	= 0.285 m^3	= 0.285 m^3
parts (¼) of oars 4 kg / 1000 kg/ m^3	= 0.004 m^3	= 0.004 m^3
extras 28 kg / 2000 kg/ m^3	= 0.014 m^3	= 0.014 m^3
hull - f.r.p 96 kg / 1500 kg/ m^3	= 0.064 m^3	
hull – wood 96 kg / 600 kg/ m^3	= 0.16 m^3	
Total volume of buoyancy	if f.r.p. hull = 0.367 m^3	if wood hull = 0.463 m^3

So for the f.r.p. hull to reach swamped equilibrium some 533 kg (900 kg – 367 kg) of the load would need to be removed. This equates to about 70% (533 * 100 ÷ 760) of the crew mass, the crew being the only element that may be removed. Alternatively, provided the crew are in *firm* contact with the hull then as they become immersed their own immersed volume will become a volume of buoyancy. If 70% of a crew (533 kg) is immersed then their volume of buoyancy will be 533 kg / 1000 kg/m^3 = 0.533 m^3. Add this to the other volumes of buoyancy and this increase to (0.533 m^3 + 0.367 m^3 =) 0.9 m^3, which gives equilibrium.

For the wood hull swamped equilibrium is reached with some 437 kg (900 kg – 463 kg) of the load removed or 58% of the crew volume immersed.

It can be seen that the difference in hull material can account for a difference in swamped support of some 12% of the crew mass. Put another way the fully swamped f.r.p. hull will support 1 fewer members of the crew than the wooden hull.

A commonplace difference in the construction materials of a rowing eight may account for a relatively large difference in its swamped load capacity.

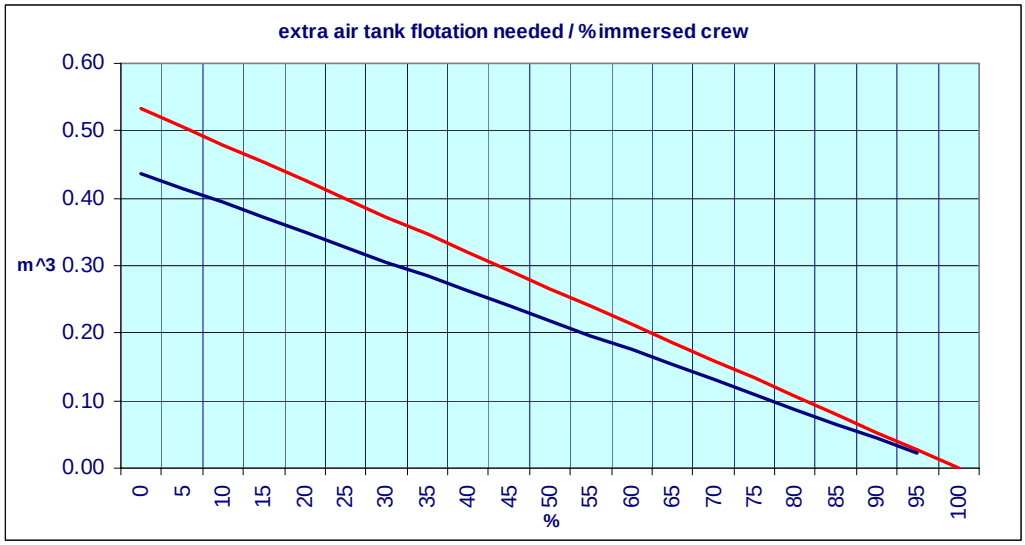
7.7.3 Results of analysis - With added flotation

To achieve swamped equilibrium with 100% of the crew above the water would require additional flotation to be added to the hull.

In the case of the f.r.p. hull some 0.533 m^3 of air tank flotation would be needed.
In the case of the wood hull some 0.437 m^3 of air tank flotation would be needed.

(In both cases again the complete hull is assumed to be submerged)

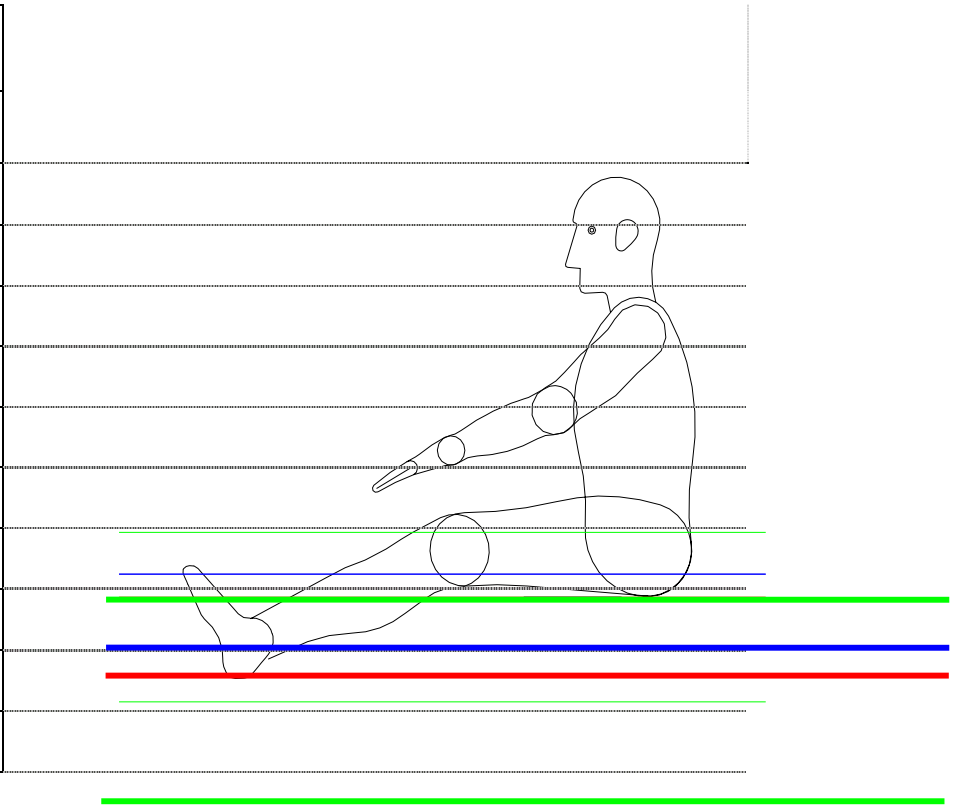
If the volume of the part of the immersed crew increases in proportion to their vertical height in the rowing position then Graph 1 would be true. The red line is for the f.r.p. hull, the blue the wooden hull. This is however very much an approximation.



Graph 1

The same data is approximated diagrammatically in Figure 3.

% crew immersed	extra flotation (m^3)	
	f.r.p.	wood
100	0.0	0.0
90	0.05	0.04
80	0.11	0.09
70	0.16	0.13
60	0.21	0.17
50	0.27	0.22
40	0.32	0.26
30	0.37	0.31
20	0.43	0.35
10	0.48	0.39



In Figure 3 the green lines depict the hull bottom on centreline and the top of the sax board, the red line the top of the seats and the blue line some 50 mm above the top of the seats. It can be seen that when the swamped waterline is approximately 50 mm above the top of the seat about 20% of the crew will be immersed which equates to an approximately 0.43 m^3 for f.r.p. Or 0.35 m^3 for wood of additional air flotation.

7.8 Practicality of buoyancy calculations

To accurately calculate the amount of additional flotation needed to be fitted in a hull so as not to exceed a required level of crew immersion when swamped would necessitate full details of the mass and density of all elements of the boat and load, including crew, plus rigorous calculation. Even if this data was available and the work undertaken, the result would only relate to the one hull and crew considered.

7.9 Wave height / freeboard

As mentioned previously the basic hazard related to buoyancy is that the boat might sink. Initially this always involves the boat filling with water and this is often through swamping by waves. Two types of wave are involved:

- Wind induced waves
- The wash of another vessel

It is therefore important to consider the relationship of freeboard to wave height.

Wave height, that is the difference between the top of a wave and the top of the wave trough, is normally measured as the *significant wave height*, which is the mean height of the highest one-third of the waves, which approximately corresponds to the wave height estimated by an experienced observer. However some individual waves will be double this height.

There is good documentation as to the expected height of wind-induced waves in open sea conditions but information is sparse for inland waters. The wind strength and free fetch of water in the wind direction will dictate the wave height. However, in enclosed narrow waters even with a good fetch the effects of banks may attenuate the wave height substantially.

Wash from other vessels is equally difficult to predict. The speed of the vessel, its displacement and general shape coupled with the depth of the water will all affect the wash wave height.

The EU Recreational Craft Directive describes *Sheltered Waters as small lakes, rivers and canals with a significant wave height of up to and including 0.3 m, with occasional waves of 0.5 m maximum height, for example from a passing vessel.*

The current draft of the UK inland waters hire boat code assigns a minimum upright freeboard of 250 mm for Category A waters and 400 mm for Category B waters. The River Thames is designated as Category A above Oxford and Category B below Oxford (a full listing of the Categorisation of Waters is published by the MCA in the Merchant Shipping Notice MSN 1776(M)). These freeboards are intended to reflect the wave height expected in such waters however neither these of these heights nor the water categorisation are based on particularly scientific measurements.

Whatever the actual height of a wave it is the freeboard of a boat that will determine whether or not water is shipped aboard. With boats of the length of competition rowing fours and eights in inland conditions the hull is unlikely to profile, that is pitch or ride over, any longitudinally encountered waves. Accordingly, the ability of such boats to avoid being swamped becomes a direct relationship between the freeboard and the wave height. A freeboard of 200 mm will withstand a wave of 400 mm in height. However the height of an individual wave can often be twice the height of the significant height and so a freeboard of 200 mm would normally only withstand a wave of 200 mm significant height.

The freeboard of the sample eight to the aft down flooding point is 128 mm and to sax board is 203 mm. These freeboards would resist swamping from most waves of up to 128 mm and 203 mm respectively in significant height. Waves of greater significant height respectively would start to swamp the hull.

The removal of the sax board across the aft end of the cockpit reduces the height of waves that would swamp a boat by the height of the sax board; some 75 mm.

A cross (at angles of between 0º and 90º to the centreline) or transverse encountered wave may, to some extent, be profiled by the hull thereby effectively reducing the relative hazard of wave swamping but such waves are likely to create a transverse stability problem.

7.10 Capacity of hull to accommodate flotation elements

Each oarsmans seat is supported at a height of some 160 mm from the floor on centreline and the free mean length below each seat is about 1.0 m. This gives a volume beneath each oarsman seat of approximately 0.04 m^3. It therefore follows that, in an eight, there is about 0.32 m^3 of volume beneath all of the oarsmans seats, which could be used for air tanks.

The hull shell itself could contain flotation by way of honeycomb or foam sheet. An approximation of the internal hull shell surface area in way of the cockpit is about 7.2 m^2 (12 m in length by 0.6 m in rise). By incorporating a sandwich layer of 10 mm in thickness over this area would give 0.072m^3 additional flotation.

Other free volumes exist within the hull, for example either side of an oarsman's legs or the full run of the cockpit around the sax board feet.

Air bags could be included in the same areas available for and as an alternative to air tanks. However, owing to their constriction the additional volumes of floatation gained would be less than fitted tanks.

In all cases the addition of flotation elements would increase the mass of the hull although this could be compensated by a reduction in the weight of construction materials elsewhere. A typical mass addition for below seat 3 mm thick plywood air tanks might be about 5 kg, which is just over 5% of the hull minimum mass. Other materials that could be used would have less mass.

The fitting of flotation could be undertaken in both new and old hulls.

7.11 Analysis of stability

7.11.1 Stability

A boat is said to be stable if it tends to return to the upright position after being disturbed by external forces, such as waves, wind or movement of the crew.

The amount of energy trying to return the boat to the upright depends on three things:

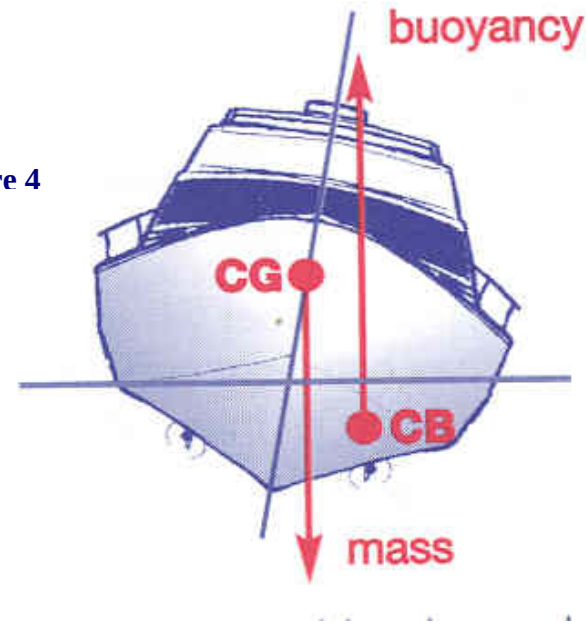
- The mass of the boat
- The position of the centre of gravity (CG) of all the elements making up the boat and its' full load (hull and crew etc)
- The position of the centre of the volume of water displaced (CB) which depends on the shape of the hull. The CB will change with loading, heel angle and trim

The boat is stable if, as it heels, the CB moves to one side more rapidly than the CG. It follows that if the CB moves to one side less rapidly than the CG then the boat may be said to be unstable.

The angle of heel at which the boat will not return to the upright without external intervention is called the Angle of Vanishing Stability (AVS)

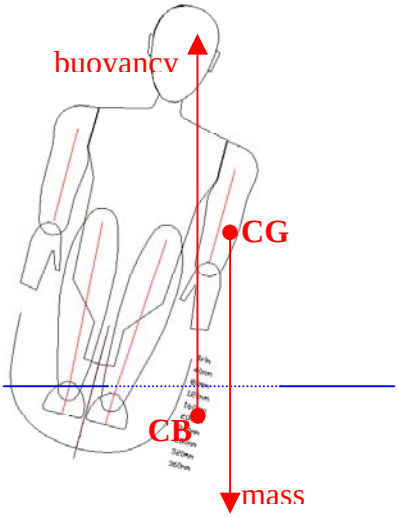
A boat's CG is normally on its fore and aft centreline and when the boat is upright, at rest, its CB will normally be in the same vertical plane. But as the boat heels the CB will move to one side as the volume of displaced water moves off centre. This creates a lever between the vertical downward force of gravity and the upward vertical force of the buoyancy. This lever will tend to turn the boat either back to upright or to capsize the boat depending upon the vertical orientation of the CB and CG. In the case of a large powerboat the CG is normally low in the hull as is the CB and the lever will tend to turn the boat back to upright as shown in Figure 4.

Figure 4



In a competition rowing four or eight the mass of the crew, who are limited in their movement, will be high relative to the CB and so the lever will, from low angles of heel, tend to capsize the boat as shown in Figure 5.

Figure 5



This will give a very low or no angle of vanishing stability unless some other external force is applied.

The reason why competition rowing boats do not regularly capsize is that the oars act like *outriggers.* This is the other applied external force. The oars move the CB outboard of the vertical through the CG and thus create a righting lever rather than a capsize lever. Stabilising the boat by the action of the oars is a *balancing act* undertaken by the crew in a similar manner to a tight rope walk and as such is very difficult to calculate or determine.

Transverse stability of competition fours and eights is virtually impossible to quantify.

7.11.2 What are the stability hazards?

A boat must have sufficient stability to resist the forces to which it will be subjected. If not it will **CAPSIZE**.

Causes of capsize include:

- Excessive offset load, e.g. crowding of people on board, heavy weights on one side
- Forces generated by waves, especially breaking waves
- Strong winds
- Hydrodynamic effects (e.g. bad hull shape, oars acting like trim tabs)
- Low initial stability

7.11.3 Swamped stability

If, for whatever reason, the crew do not or are unable to stabilise the boat with the oars then a capsize is likely to occur. This might be through the crew letting go of the oars or the oars being feathered alongside the hull or through their acting like trim tabs or a paravane inducing a roll in the boat. In any such case the boat will swamp *over the side* during the capsize process owing to the freeboard becoming less due to the boat heel. Once capsized and swamped the boat would adopt any number of different of attitudes of flotation, upright, on its beam-ends or inverted.

The attitude of a swamped boat in the water will be dependant on the position of the crew, the oars and volumes of flotation within the hull. Inevitably, and hopefully, the crew will free themselves from a capsized hull and thereafter not be a part of the initial swamped stability consideration. Taking the hull alone, its immersed flotation, having a density less than water, will tend to try to move to the surface. If the flotation is in the bottom of the hull and this will be the majority case, then this effect is likely to cause the hull to invert and to float up side down. The oars, provided they are themselves buoyant and not feathered, will resist this effect. So as with un-swamped stability it is the position of the oars that is of prime importance. Whatever the case, some or all of the crew will be in the water and without any other means it will be the boat that will be the closest means of support.

It is important a boat's swamped buoyancy is able to support the boat and crew.

It is acknowledged that if a hull is fitted with sufficient flotation to support the crew in the upright swamped condition then it will support the crew equally when capsized.

7.12 Consideration

7.13 Performance standards and tests

The required level of acceptability is often included within rules and/or regulations, as with the FISA rule in 4.1 above. However it is better if the requirements are dealt with in an external standard to which the rule or regulation refers and invoke. A standard can often be updated or changed more easily than a rule. Additionally the standard can be external from the regulator, which removes potential liability as well as improving expertise in the substance and credibility of the standard.

Rules and regulations should invoke but not be standards. Standards should not themselves be rules or regulations

During 2003 the British Standards Institute (BSi) published the International Standard BS EN ISO 12217:2002 entitled Small *craft — Stability and buoyancy assessment and categorisation*. This standard is a three part standard developed by the recreational craft industry, other experts and the EU in support of the EU Recreational Craft Directive. Although the Standard excludes from its scope boats with a beam of less than 1.1 metres it nevertheless serves as a guide to the type of requirements a community of international experts would consider suitable to quantify and assess the stability and buoyancy of recreational boats.

Competition rowing eights and fours have a hull length greater than 6m and so, if they were included within the scope of ISO 12217, would fall under Part 1 of the Standard – *non-sailing boats of hull length greater than or equal to 6m.* Assessment option 4 of this Standard includes tests for checking down flooding height, offset load stability and swamped flotation which in the context of competition rowing boats, in general terms w requires: -

7.14 Height-height test

The test is to demonstrate sufficient margins of freeboard for the boat at loaded displacement mass before water is shipped aboard.

This test is performed using people or using test weights to represent people (at 75 kg per person), or by calculation (using a lines plan and displacement derived by weighing or measured freeboards), in calm water with all items of maximum total load including the people positioned so as to achieve the design trim.

7.15 Offset-load test

The test is to demonstrate sufficient stability against offset loading by the crew for unswamped boats. It sets minimum freeboards requirements for the boat when either the crew or test weights are positioned offset from the boat centreline.

7.16 Flotation test

The test is to demonstrate adequate swamped buoyancy and stability using the method in annex E. where flotation elements are used; they shall comply with annex F.

Annex E - Method for level flotation test

B.1 General

The methods described in E.2, E.3 and E.4 shall be used, either by actual test or equivalent calculation.

E.2 Test condition

During the tests, the boat shall be in calm water in the light craft condition and then equipped as follows:

- Care shall be taken throughout the testing to eliminate entrapped air other than in air tanks or air containers.
- Void compartments integral with the boat structure and not complying with the requirements for air tanks in annex C shall be opened so that they become swamped with water.

E.3 Swamped stability test

Metallic test weights shall be suspended over the side of the boat at each of four set positions in turn. As an alternative to suspending test weights, an equivalent heeling moment (calculated when the boat is upright) may be applied using persons positioned inside the boat at seat level. Persons may only be used if they are not immersed when the boat is heeled. The boat is then swamped and in the swamped condition shall not heel more than 45º.

E.4 Swamped buoyancy tests

Metallic test weights are loaded on the inner bottom of the boat, evenly about the centre of the area available to the crew, according to the crew limit (CL) and an additional given amount. Alternatively, provided they are not immersed above the knee, people may be used instead of test weights. The boat is then swamped and in the swamped condition shall float approximately level with more than two-thirds of the length of the top of the gunwale or coamings (including those across bow or stern) above the water.

Annex F - Flotation material and elements

F.1 Requirements

Flotation elements shall comply with the requirements in Table C.1. Other types of flotation elements shall be evaluated following the same principles.

Table F.1 — Requirements for flotation elements

Property	Air tank	Air container	Inflated bag	Low density material
Air tightness	RT	RT	R	
Mechanical robustness or protection	R	R	R	R
Draining facility	R	R		
Resistant to or protected from sunlight		R	R	R
Fitted with an inflation point			R	
Temperature resistant – 40 °C to + 60 °C				R
Water absorption max. 8 % by volume				R
Securely fastened		R	R	R
Encapsulated or resistant to liquids			R	R
Label: “Do not puncture air tank/container/bag”	R	R	R	
NOTE 1 R denotes that this property is required but is not subject to a specific test by the builder. NOTE 2 RT denotes that this property is required, and is required to be tested by the builder.				

F.2 Tests

Where air tanks or air containers are used, they shall be subject to a pressure test, carried out at an initial overpressure, with a permitted pressure drop within 30 s.

In summary the International Standard includes four tests in two conditions as follows: -

Un-swamped condition - down flooding-height test and offset-load test
Swamped condition - buoyancy test and stability test

Each test may be undertaken using either test weights or people or by calculation. The checking of flotation elements is also included in the ISO.

The down flooding-height test may be worthwhile for a competition rowing boat to demonstrate and assess the differences between the height of a fully encompassing sax board and the aft cockpit down flooding points.

The unswamped condition offset-load test is however of doubtful value owing to the relatively small beam of the boats and *outrigger* action of the oars.

The ISO tests for swamped buoyancy is considered very relevant to competition rowing boats, a view substantiated by these tests using the same basic methods as described in the FISA rule (see 4.1). The differences between the ISO and FISA test are the test parametric limits and that ISO additionally requires the checking of flotation elements.

The final ISO tests for swamped stability is less relevant to competition rowing boats for the same reasons as those for the unswamped offset-load test.

An ISO type test for swamped buoyancy is considered very relevant to competition rowing boats.

7.17 International or Sports Federation Standard

The application of an internationally agreed and accepted Standard as part of a rule or regulation has both disadvantages and advantages over the application of a sports federation “in-house” drafted standard.

The main disadvantage of an International Standard is where it does not *fit* with the requirements of the end user. An example in the sailing world was with life-raft specifications where the only international standard was for ships life-raft. These were too bulky and heavy for yachts and as a result the international yachting authority drafted its own, “in-house”, yachtsman’s life-raft standard.

The main advantage of an ISO or similar internationally accepted standard is that most National Government Authorities will accept the application of such within their territories whereas some will not accept standards written by non-governmental bodies. An example in the sailing world was that Australia refused to recognise the international yachting authority’s yachtsman’s liferaft standard for application during the 1998 Sydney Hobart race. Three lives were lost during the race as a direct result of liferaft failure.

The solution to this dilemma for the sailing world was to gain representation (via the EBA) on the appropriate International Standard Organisation technical committees and work within these to achieve ISO's that did *fit*. During 2005 ISO published an International Standard specifying a yachtsman’s life-raft. This ISO closely resembles the international yachting authority own, “in-house”, yachtsman’s life-raft standard.

Representation on an ISO Working Group may be gained through either a National Standards organisation, which for the UK is the British Standards Institute, or via an ISO internationally recognised organisation, which could be FISA, or, in Europe, the European Boating Association (EBA – www.eba.eu.com) that is already recognised by ISO for small craft representation.

ISO 12217 for small craft stability and buoyancy has and will continue to benefit from recreational craft user representation. **Rowing authorities could use this representation as a conduit to influence the content of the International Standard**

7.18 Member club owned boats

As a result of a sail training vessel foundering with the loss of life, the U.K. Maritime and Coastguard Agency (MCA) has introduced a Code of Practice for Small Commercial Vessels. This Code is a legally acceptable alternative to Load Line Certification, the substantive legislation.

During the last review of the Code, a question arose as to the status of a club-owned boat when used by club members. Were these vessels in commercial use or were they privately used recreation craft? If in commercial use then the vessel when *at sea*, needed to be coded. Such, Coding includes the assessment of stability and flotation requirements and tests.

The final answer was that a boat owned by a members' club, used by the members and family and close friends, was a private boat and did not fall under the requirements of the Code. But this decision only came after user organisations agreed to implement their own voluntary equivalent safety code for such private *sea* going boats.

A further Code for Inland Hire Boats is currently under development by the MCA, which might similarly cover a boat for inland use. Stability and flotation will be included in the Inland Code.

Clubs that own member used boats should apply a safety regime for the use of the boat and this regime should included consideration of the boats' stability and floatation

Failure to do so may prompt Regulation.

7.18.1 Builders' obligations under law

The Recreational Craft Directive (RCD)

On the 16 June 1998 the EU Recreational Craft Directive 94/25/EC came into force. This Directive has been transposed in British law as the Recreational Craft Regulations 1996 S.I 1996 No. 1353. This Directive applies to

Any boat of any type, regardless of the means of propulsion, from 2.5 to 24 metres hull length intended for sports and leisure purposes. The fact that the same boat could be used for charter or for recreational boating training shall not prevent it being covered by this Directive when it is placed on the market for recreational purposes.

And the manufacture of boats in compliance

Shall affix the CE marking to each product and draw up a written declaration of conformity

Amongst others

The following shall be excluded from the scope of this Directive:
Craft intended solely for racing, including rowing racing boats and training rowing boats labelled as such by the manufacturer.

Since 16 June 1998 all competition rowing boats either placed on the market or put into service within the EU should have, by law, been either RCD compliant and CE marked by the builder or labelled by the builder as intended solely for racing.

Figure 6 shows a typical racing label and Figure 7 a typical CE builder's plate

Figure 6

Figure 7

7.19 CE marked or labelled as intended solely for racing

The decision as to whether to CE mark a boat or to label it, as intended solely for racing is a matter for the decision of the builder.

Although labelling a boat as intended solely for racing would appear to be the correct and simplest option for competition rowing boats, this may not necessarily be the case. Whereas there is virtually no cost involved in excluding the craft from the RCD by the application of such a label, choosing this option also excludes the boat from the "protection" of the RCD. This means that the boat, through individual States' domestic law, could be excluded from entering certain countries, including EU countries, at any time now and in the future. Additionally, such an RCD exclusion label, gives potential purchasers or users no indication as to the boats' *safety.*

To comply with the Directive and be able to legitimately affix a CE mark would require a boat to comply with the appropriate Essential Safety Requirements of the Directive. In the case of a competition rowing boat these are primarily that the boat should be *strong enough in all respects* and that *it has buoyancy characteristics appropriate to its design category*; in this case *sheltered waters*. There are also a number of documentation and administrative requirements. For a sheltered water boat all of these tests and other requirements may be undertaken as self-certification by the builder without the need for any external, third party involvement.

Although many sailing dinghy and yacht designs are primarily intended for racing, for commercial reasons, some mentioned above, a large number of these boats are nevertheless CE marked. This includes a large proportion of Olympic classes.

7.20 Ways to demonstrate RCD compliance

If a boat satisfies the appropriate requirements of an RCD mandated / harmonised International Standard it is legally presumed to comply with the RCD in that respect.

ISO 12217 for small craft stability and buoyancy is an RCD mandated / harmonised Standard.

If there is no appropriate mandated / harmonised Standard then the builder should apply a standard of equivalent value.

In the case of structure, an equivalent standard that may be used to demonstrate is *empirical knowledge as to the structural requirements of the hull i.e*. a statement, with supporting data, that the materials and method of construction used over many years has shown no or few failures.

Although the scope of ISO 12217 does not include competition rowing boats the tests included in this standard might be acceptable as having an equivalent value, as might the existing FISA rule and/or ARA code with appropriate modified limits.

7.21 Policing of RCD

The policing of the RCD, that is the policing of correct labelling and that a boat with CE mark affixed does comply with the Directive falls to different agencies in different countries. In the U.K. it is Trading Standards. There is however a multi -state Cooperation Group, which sets out guidelines for consistency to all 28 EU member states. Penalties for non-compliance in the U.K. are a maximum of a £5000 fine or 3-month imprisonment. There have been a number of prosecutions since the Regulations become law.

7.22 Enforcement

Enforcement is primarily a matter of conformation of compliance. That is to say provided an item complies with the appropriate rules and regulations then there is no need for enforcement. It is for this reason that the first tool in the enforcement armoury is commonly the Declaration of Conformity (DoC). Most EU New Approach Directives included a requirement for a DoC and a typical one, for a Nokia telephone is illustrated in Figure 8.

Figure 8:

Use of a Declaration of Conformity is an initial tool to rule or regulation enforcement

Enforcement of mandatory regulations will be the subject of the individual Regulations themselves. In the case of the RCD, in the U.K. this is Trading Standards. With the MCA SCV Code this is the MCA. In both cases physical enforcement is sparse however; as awareness of the regulation is generally good, self-enforcement is commonplace owing to the threat of penalties for non-compliance.

In the case of voluntary regulations, enforcement is less straightforward. However the threat of penalties or sanctions and/or litigation is often still sufficient to achieve good self-enforcement provided, as with mandatory Regulations, there is awareness of the regulations.

Awareness of rules and regulations is important, particularly any penalties or sanctions for non-compliance and for the rules and regulations to be applied on a voluntary basis there is a need for these to include appropriate penalties or sanctions for non-compliance.

Enforcement also hinges on the matter of who is the responsible party.

With a new boat it should be the builder that is the responsible party (as already determined by law) whereas with an *owned* boat it should be the owner. The rules and regulations should state this.

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8.0 Conclusions

8.1 ARA WSC and Strategy and role of Regional Safety Advisors

The current WSC's key strength is the complete distribution among clubs, and its wide recognition within those clubs. The development of the Code since its inception in 1984 has meant that it has, during revision, taken on a lot of additional technical information but has not fully moved forward from a document of rules and regulations.

The fact that it has been found not to meet the needs of either the individual rower or club officer, stems from the requirement of the various people (WSA / CWSA /Club member) who use the document as both a reference source, guidance document and enforcement tool. Like the Highway Code, it contained all of the necessary information but was not packaged in either a user friendly or specific audience targeted manner.
The revised code encompasses a much wider range of activity, including the off water risks associated with rowing. The proposed system within the 'Row Safe' scheme addresses the majority of the shortfalls with the current code, and should cement the ARA's transition from rule setting to a goal -based risk management approach.

The code's weakest point was its inability to communicate key messages to the right individuals. It can be argued that this was indicative of the mixed objectives for the code itself. From our observations and discussions with those involved with managing the risks within the sport, the changes to underlying systems and approach that are already under way 'should' ensure that future manifestation of the code (e.g. Row Safe) is robust enough to meet the challenge.

The commitment of the regional advisors, and those charged with managing risk within the sport is undoubted. However, because of the demands of each region being different, the scale and workload involved in the roles meant that the advisors could not effectively meet all the requirements of the job description.

8.2 ARA Club auditing Process

The current process was criticised by both those responsible for carrying them out, the clubs' safety adviser and by those responsible for collating them and forwarding back centrally to the ARA, the regional advisers.

Those in regions with high levels of activity saw it purely as an administrative task. This stems from the volume of responses, as there were too many for them to review in depth and therefore gave little or no feedback to clubs.

For the clubs who received little or no feedback the 'carrot and stick' for complying with the request from the ARA was that completion of the process was a key requirement in allowing individual clubs to race.

In the regions where activity was very high some advisers used the event approval role of the regional adviser to implement safety management rather than the audit process and in-depth reviews of event planning and management was seen by them to be as effective.

The club/centre audit system operated by the ARA is significantly different to that operated by the BCU and the RYA in their respective teaching approval or recognised teaching centre audits. These schemes ensure that there is an independent audit of a centre or club's management and safety system that the ARA system does not have.

8.3 Boat Buoyancy

There are four main areas that need to be addressed, these are issues relating to the legal responsibilities and implementation of standards, measuring of buoyancy, the practicality of ensuring buoyancy in old and new boats and covering boat buoyancy within risk assessment, ensuring that *appropriate* control measures are implemented. In summary:

- Rules and regulations should invoke but not be standards. Standards should not themselves be rules or regulations.
- The decision as to whether to CE mark a boat or to label it, as intended solely for racing is a matter for the decision of the builder.
- ISO 12217 for small craft stability and buoyancy has and will continue to benefit from recreational craft user representation. Rowing Authorities could use this representation as a conduit to influence the content of the International Standard.
- Since 16 June 1998 all competition rowing boats either placed on the market or put into service within the EU should have, by law, been either RCD compliant and CE marked by the builder or labelled by the builder as intended solely for racing.
- A commonplace difference in the construction materials of a rowing eight may account for a relatively large difference in its swamped load capacity.
- Transverse stability of competition fours and eights is virtually impossible to quantify.
- An ISO type test for swamped buoyancy is considered very relevant to competition rowing boats.
- To accurately calculate the amount of additional floatation needed to be fitted in a hull so as not to exceed a required level of crew immersion when swamped would necessitate full details of the mass and density of all elements of the boat and load, including crew, plus rigorous calculation. Even if this data was available and the work undertaken, the result would only relate to the one hull and crew considered.
- It is important boats' swamped buoyancy is able to support the boat and crew.
- The fitting of floatation could be undertaken in both new and old hulls.
- The removal of the sax board across the aft end of the cockpit reduces the height of waves that would swamp a boat by the height of the sax board; some 75 mm, although this potentially allows water to pass out over the back of the boat more readily.
- Clubs that own member used boats should apply a safety regime for the use of the boat and this regime should include consideration of the boats' stability and floatation.

8.4 Incident Reporting

The current system in place is not providing consistently good usable data and should be enhanced and developed. The importance must be shown to individual rowers to complete forms as fully as possible with the specifics of who, where, when and why in line with WHO guidelines. Because fatality data is thankfully 'too few and far between' analysis of incident data is the only way of spotting trends that could compromise the safety of the sport and rowing activity.

8.5 Club Management of Rowing Activity

All of the clubs were aware of their responsibility and all strived to ensure that they treated the issue safety management properly and developed risk controls. However there was, as expected, variations in how well they achieved these tasks. All clubs found it difficult to ensure that safety was a collective feature of the club and that all rowers had responsibility for safety management. Individual rowers in the majority saw safety as a function of a specific club officer rather than an issue for themselves, this has to be challenged to fulfil the desired aim for collective responsibility within the sport. Specific individual safety issues need to be resolved relating to on water management of activity, realising the difference between coaching and supervising and carrying out suitable and sufficient risk assessments.

8.6 Overall

The system in place is fairly robust, and safety issues with it will be picked up if resources are available and are kept on the national, regional and local agendas. However the implementation of the policy objectives, guidance and rule demands is currently a weakness – i.e. WSAs cannot monitor current rowing practice effectively and have limited opportunities and ability for enforcement. Therefore the focus for change, based upon on training, education and developing capacity is the only feasible way forward for the ARA and individual clubs to effect a wide scale behavioural change in the sport. In reality the coaches, club chairmen and CDOs are the best placed players to drive this change. The clubs WSAs, RWSAs and the National WSA are technical advisors and need to assist with the parameters and deal with specific issues. They cannot and should not police the sport, which is by its very nature voluntary.

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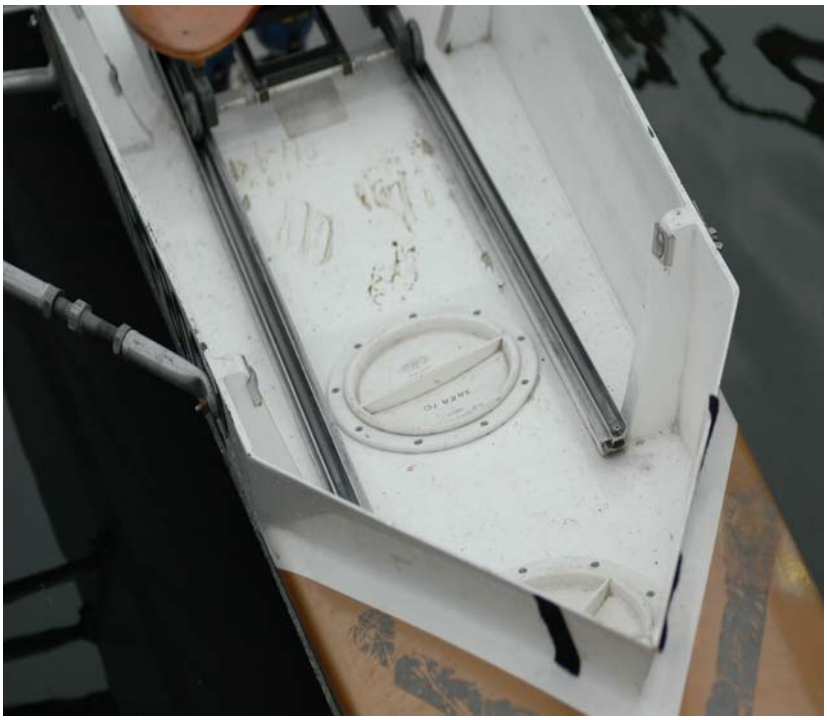

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9. Recommendations (Proposals and options)

The recommendations of the report are divided into three specific areas these being: Systems and guidance, people and roles and lastly equipment. Where possible we have tried to indicate whom these recommendations are applicable to and who would be responsible for their implementation. We feel that these recommendations will make significant improvements to safety within the sport and improve the effectiveness of the WSC which we are aware is currently being revised and so an ideal opportunity to make improvements currently exists.
Because of the support we have received for these suggested recommendations those who have been identified as those best placed to implement them should make every effort to do so.

9.1 Systems and guidance

9.1.1 Risk assessment and safety management

- The need for the sport and clubs to operate a system of risk management to ensure the required level of safety for participants. Clubs needs to accept the need for proportionality in their risk management role.
- Additional guidance delivered to clubs supporting this process by the ARA.

9.1.2 ARA Club auditing process

- Club audits-review and feedback – RWSAs should as a matter of course ensure that this occurs if requested.
- Review current process and should consider independent reviews or club safety officers auditing neighbouring club rather than their own.
- To look at club approval or centre recognition schemes run by BCU and RYA to see if there is any that could be adopted by the ARA, this could be facilitated through the NWSF Water sports Safety Advisory Group.

9.1.3 Club Management and structure

- Spread responsibility for safety throughout club.
- Introduce risk assessment and safe systems of work for maintenance and boat repair activity.

9.1.4 Rowing boat transportation and competition attendance

- That the guidance developed to manage the risks of towing trailers is more widely available and individual rowers are aware of it. That awareness of the issues relating to driving long distances to compete is also covered and flagged as a safety issue for the sport.

9.1.5 Rowing boat identification, craft registration and adherence to navigation authority rules

- That the current craft registration scheme operated on the Thames tideway is extended across all craft through the ARA regions making them easily identifiable and so more accountable for the crews' behaviour.
- That on other complex waterways that similar codes to the PLA Tideway Code for the tidal Thames are drawn up and agreed with relevant stakeholders and regulators or operators.

9.1.6 Incident reporting

- When developing its incident reporting the ARA should consider reporting schemes operated by other NGB's especially that operated by BSAC.
- The ARA should develop the ability for Clubs to report online and so as an NGB have greater ability to contribute to national water related incident databases.
- Guidance should be provided to boat crews by the ARA and clubs in turn over the importance of incident reporting and the provision of photographic or video evidence to support such incident reporting.

9.1.7 Hypothermia, Cold water shock and capsize

- Specific risk assessment of incidents of immersion and hypothermia should be carried out by clubs for winter activity, there was little evidence that clubs revised their assessments in light of conditions in the winter period.
- Ensuring because cold is the killer, that clubs have better procedures in place and individuals are more aware of the issues relating to cold water immersion.
- Promotion of the 1 minute 1 degree code that is operated at Eton Dorney Lake.
- The uncertainty about rowers ability to deal with capsize needs to be addressed with better systems of training and monitoring being provided by clubs.

9.2 People and roles

9.2.1 ARA WSC and Strategy and role of regional safety advisors

- The code whilst it is currently being revised by the ARA should be formatted so that it is more user friendly and takes on board relevant recommendations in this report. It should contain sections aimed at the specific needs of the someone entering the sport, along with more experienced rowers, club officers and coaches.
- That the ARA fosters a more collective view of safety within the sport.
- ARA to produce additional guidance delivered to clubs supporting the WSC on hypothermia and capsize management.
- The ARA should through the National WSA committee standardise, develop adequate capacity and support the role of regional WSAs more clearly.

9.2.2 Supervision of water activities

- ARA to develop guidance on and for clubs to introduce documented daily launch decisions based on dynamic risks assessments and criteria that are logged as to why activity is done on any particular day.
- Clubs to introduce better logging of boats and crews from club houses onto and off water – a simple wipe board system is used by some clubs and would be sufficient.
- Introduce named nominated officer of the day.
- Clubs need to review their communication systems between coaches, boats on water and nominated officer of the day and or boat house.
- That clubs and the ARA specifically differentiate between coaching and supervising role, namely by establishing a definition of the different activities and specific limits of role, responsibility and activity covered.

9.3 Equipment

9.3.1 Boat buoyancy

- The ARA, together with manufacturers, should develop a test of the swamped flotation of competition rowing fours and eights generally along the lines of and giving a similar appropriate degree of swamped flotation as the test already included in the ISO 12217 – 1. Manufacturers should then test new boats prior to them being brought into the market place.
- The ARA should consider promoting such test to ISO for inclusion within the next edition of the ISO Standard.
- The ARA should modify their current policy on boat buoyancy. A new policy should state that all boats shall be buoyant, that they should have internal buoyancy and have an agreed policy for retrofit of existing boats or develop a system of dispensation for non-buoyant boats. This should be through a specific risk assessment that takes into account the type of water rowed on, the conditions and experience of the crew, so that compensatory features (increased supervision/rescue craft provision, rower awareness of buoyancy issues is heightened to balance against the fact that these boats are less buoyant and require a more developed safety management regime*)* are in place.

- That the ARA considers the implementation of a time period five years or so as a timescale for when all boats should meet a new buoyancy standard.
- Rules and or regulations should be introduced to: -
    A. Require each model of competition rowing fours and eights to be subjected to and pass the test prior to sale generally as required by the EU Recreational Craft Directive. The responsibility for such shall be the builder who should complete a Declaration of Conformity in respect of ever boat sold and pass such to the purchaser of the boat.
    B. Require each owner of a competition rowing fours and eights to periodically apply the same test to each of their boats and for the boats to pass the test. Also to complete a similar Declaration of Conformity for their own keeping and for inspection as and when required under the rules.
    C. Set out a regime for the inspection of Declarations of Conformity e.g. prior to competition, and include penalties and / sanction for if non-compliance is determined.
    D. Ensure builders of competition rowing boats address their obligations the to the RCD.

    The above recommendations relate to the levels of buoyancy required in rowing fours and eights to ensure adequate flotation when either swamped and/or capsized and consider the regulation of such. In this respect they are made in isolation and without consideration of any other factors or influences that would affect the safe operation of competition rowing fours and eights. It is therefore important that the above recommendations are given further consideration together with those other factors that may, in some cases, offer perfectly adequate alternatives to achieve the same levels of safety.

9.3.2 Rowing boat and equipment manufacturers and suppliers

- That ARA and or manufacturers should attempt with the assistance of the British Marine Federation to create or support a trade association or similar body, especially as clubs are increasingly importing boats from foreign manufacturers. In discussions with the BMF they would support and encourage this development as much as possible.

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Appendix One – Principal authors and researchers

Peter Cornall – Head of Leisure Safety
Peter Cornall has been Water and Leisure Safety Manager within RoSPA's Safety Policy Division for six years. In this role, he manages the provision of safety expertise and technical information in the field of water, leisure and play safety, and facilitates the development and promotion of safety policy and research.

Prior to this appointment, Peter worked for 16 years both in outdoor recreation and outdoor education roles, including managing water sports centres which provided rowing as one of their activities, outdoor and adventurous activity teaching and instruction, sports development and country park ranger roles, primarily for local authority education departments and for leisure services departments.

Currently Peter chairs a BSI Standards Development committee that has developed water safety signage and is currently developing a standard for beach safety flags and a code of practice for their use. This work has been the basis for the formulation of an international committee that will hopefully develop world ISO standards in the same area. Peter has been nominated the UK expert for that panel and currently is a member of the UK's Blue Flag and Seaside Award jury.

One aspect of Peter's department's role is providing the secretariat for the National Water Safety Forum. Peter has experience in working with many of the NGBs associated with this research proposal and has been a member of working groups that have developed outdoor safety guidance along with being involved in consultation and the last review of HASPEV for the DFES.

Ken Kershaw - I.Eng AMRINA RCD Technical and Quality Manager RYA
Ken, is the RYA Technical Manager, and heads up the RCD team. His RCD knowledge and experience spans over 20 years, representing both the RYA and European Boating Association in Brussels and with the UK Government.

Ken has been involved in the constructional control of small boats since 1973. Ken has been involved in the development of a number of buoyancy and stability standards including the MCA Code of Practice for Small Commercial Vessel and the International Standard Organisations ISO 12217 – *Small craft — Stability and buoyancy assessment and categorization* where he leads the British Standard Institute delegation to ISO. Within his role at RYA he is the signatory for the RYA MCA Certification Authority for Small Commercial Vessels and a DTi approved Notified Body for the assessment of craft under the EU Recreational Craft Directive.

David Walker - Information Manager
David is responsible for undertaking and managing the day-to-day aspects of RoSPA's information gathering and publication services. Notably he is responsible for the RoSPA / RLSS drowning database and dealing with the associated requests for technical water safety and research information.

Previously to working at RoSPA, David has worked in outdoor centres and for the Duke of Edinburgh's award. He holds several coaching awards including MLTE, BCU, and RYA. He is a keen kayaker and climber.

David has a HND in Leisure Management, and a first degree in Business Information. Previous roles have included a research consultant for Knight, Kavanagh & Page (KKP), whilst at KKP he was involved in a wide variety of research projects for both private and public clients, which included: Sport England, DCMS, The Manchester 2002 Commonwealth Games and several Local Government Authorities.

Elisabeth Walker- Research & Information Officer
Elisabeth is Information Officer for the Leisure Safety Department at RoSPA. She has a Bachelor of Arts (History) and an information management postgraduate qualification, obtained in New Zealand. Her background is in information, research and analysis and she supports the Leisure Department in all areas of work including information dissemination, research, and consultancy. She has an interest in, and has previously studied, the history and social impact of sport and brings this interest to the work she undertakes.

Peter MacGregor -Principal Water and Leisure Health and Safety Consultant
Peter MacGregor has broad experience in occupational health and safety and competitive water sports have brought these two disciplines together to develop a coherent approach to safety strategy. He is a RoSPA-trained QSA health and safety auditor and also has extensive experience in auditing water safety arrangements for water sports, open water areas, swimming pools, lakes, beaches and docksides. Peter has a very hands-on approach to investigating accidents and has acted as expert witness for a number of water-related accidents and fatalities. Peter has recently provided expert advice to a judicial review on water safety.

As well as the technical and legislative aspects of his reporting he is able to bring his considerable managerial experience to bear on the managerial aspects of safety arrangements and comment accordingly. Peter holds an MBA, is a Fellow of the British Institute of Management and a Member of IOSH and the Institution of Fire Engineers.

Appendix Two – ARA Regional Water Safety Adviser Job Description

Regional Water Safety Adviser Job Description

At the Water Safety Committee meeting on 28th February 2004 the following job description of the Regional Water Safety Adviser was agreed:

- Be fully conversant with the Water Safety Code and Guidance Notes
- Assist with risk management where requested
- Receive and act upon the Annual Club Safety Audit return
- Give feedback and / or advice on incidents
- Give feedback on Safety Plans for events
- Promote safety training within the Region
- Facilitate contacts with local river users groups or similar bodies to assist understanding and resolve areas of conflict between users
- Facilitate contact between clubs and local navigation or other relevant water authority relating to local water or weather conditions
- Advise Club Officers where unsafe practices are seen to be taking place
- Exercise authority, in conjunction with the Regional & Club Officers, to suspend boating activities where seen to be unsafe.
- Report to Regional Council meetings
- Produce an Annual Safety Report for the Region
- Disseminate good practice
- Develop contacts with Club Water Safety Advisers
- Establish and maintain contact with the National Water Safety Adviser

This can be adopted by Regional Rowing Councils and used for succession, planning, training and reference.

Appendix Three: Parties Consulted

The following parties are those we have been able to meet with and talk to either in person or on the telephone, regarding the safety of the sport of rowing. It is greatly appreciated that each person we spoke to took the time to meet with us, or talk to us, to assist in this review.

Rowing Clubs	
Agecroft, Bewdley, Coal Porters, Cynet, Dartmouth, Eton College (Dorney Lake), Runcorn, Totnes, Torquay, Salford University, Trafford	
Water Safety advisers	
ARA Honouree Water Safety Adviser	
Club Water Safety Advisers	
Regional Water Safety Advisors	
Stakeholders	
Stephen Blockley Jane Blockley	
All Party Parliamentary Rowing Group	
Sport England	
ARA	
ARA- National Water Safety Advisers Committee	
ARA Junior Rowing Commissioner	
ARA Council Water Safety Working Group	
Other Rowing Organisations	
BUSA	
Coastal Amateur Rowing Association	
Dorney Lake Regatta Course Warden	
FISA- materials specialist (Boat design)	
Rowing Canada	
Other water sports organisations and NGBs	
RYA	
Chair NWSF Water sports Safety Advisory Group	
BSAC	
BMF- Nik Parker	

Appendix Four: NGB data collection

Data Collection by Water Sport Organisations

Organisation	Governing or Representative Body	Reporting System	Data Collected
Adventure Activities Licensing Authority	Neither	None	Excel spreadsheet carries data back to May 1985, in order to record fatal accidents occurring on school visits.
Association of inland Navigation Authorities			
Amateur Rowing Association	Governing	Yes – voluntary, but required under the ARA's rules.	Excel spreadsheet carries data back to 1994 recording incidents involving injury or significant damage to equipment.
British Canoe Union	Governing	Yes - voluntary	Online report scanned and saved - system started 2003
British Dragon Boat Racing Association	Governing	None	Limited system with just two reports
British Kite Surfing Association	Governing/ Representative	None	Paper-based accident books
British Long Distance Swimming Association	Representative	None	No
British Sub Aqua Club	Governing	Yes - It is mandatory for BSAC members to report all accidents	BSAC collect and collate a comprehensive diving related accident dataset.
Sub Aqua Association	Representative		
British Surfing Association	Governing	None	No
British Triathlon Association	Governing	None	No
British Water Ski Federation	Governing	None	Paper-based collected for insurance claims
British Wave Ski Association	Representative		
Channel Swimming and Piloting Federation	Representative	None	No
Model Yachting	Representative		
National Federation of Anglers	Governing	None	For insurance purposes
National Federation of Sea Anglers	Governing	None	For insurance purposes and some collation of incident information.

National Sailing School Association	Representative	None	Basic system for insurance purposes
Royal Life Saving Society	Governing	Yes – joint reporting form with RoSPA.	Since 2002, RLSS relevant information has been entered into a Microsoft Access database.
Royal Yachting Association	Governing	None	None
Salmon & Trout Association	Governing/ representative		
South & South West Association of Traction Kiters	Representative		
Surf Life Saving Association of Great Britain	Governing	Collected accident data ever since the society began in 1955.	Originally this was done through a paper-based system, although now an Excel spreadsheet is used
UK Windsurfing Association	Representative	None	None

Appendix Five: Sample ARA Audit Form

AUDIT SAMPLE 1	Policy	Organising	Planning	Implementing	Monitoring	Audit	Review	Other
Junior & Beginner policy	**Q Yes** Swim / Life / Buoyancy test for beginners	Part of safety policy.	A competency test is taken to ascertain boat-handling etcetera (Akin to BCU 1*).	In pool then in the inner basin (sheltered water). No formal check of swimming abilities before this – however members are asked about their swim ability, and if can't swim compelled to wear buoyancy.	As part of induction regime Ongoing by club members	Self audit – annual.		
Capsize / Rescue	Junior & beginners will capsize practice as part of induction. Senior crews do not practise capsize drills. All under 18's have to undertake an annual capsize test.	Part of safety policy. Coaches and WSO responsible for checking this?	BA test once a year / LJ test regular basis.	Depends upon ability and confidence. No 'newbies' on outer basin 11-15 launch on water – 16-18 with coach	?	Self audit – annual.		
Capsize drill	See ARC capsize policy. Senior members do not have to perform drill.	Part of safety policy.	Annual test	New and beginners are required to perform capsize drill. U18's are required to repeat once a year.	Incident book Annual assessment No checks for senior adults	Self audit – annual.	Club safety book monitors reportable incidents. How is this communicated?	Policy is ambiguous: " Leaving the boat & swimming is a last resort" Also see comments about risk assessments.
Swimming ability	Written statement from member stating ability to swim. "All rowers, coxes and launch drivers must be in good health and be able to swim 100m in light clothing" "Any member of the committee or coach will have the authority to prevent anyone from going afloat who they believe cannot swim"	Part of safety policy.	Part of induction process. All members are invited to safety brief.	Junior has to perform CS drill as part of induction. Non swimming members are offered BA to wear	Coach / WSO / other nominated person has to supervise test & record signed statement.	Self audit – annual.		

ROWING CLUB AUDIT

SAMPLE 1

Boat buoyancy	All new boats (post 03) are required to meet the ARA buoyancy requirements. Older boats to be assed for levels of buoyancy?		Purchasing new boast to meet ARA buoyancy standards.	Only allow non-buoyant boat out in good conditions & not at Thames events. 8 (of 42) boats are deemed to require additional buoyancy. Phasing out older boats over a 5 yr period?	Boats weighed at FISA events Unsure how determined otherwise. – Based upon manufacturers stated info. Unsure about determining factors for other 8 boats /crew.	Self audit – annual.		"*There is no sensible argument about boat buoyancy... The ARA should draw a line under the argument – accept it and move on.*"
Kit maintenance	No policy statement other than regular checks must be made (detailing checks).	Label and id kit as a result of visual checks	Annual check of BA Bi-annual check / replacements of LJ. Daily visual check of boats before launch.	Safety officer / Cox and captions responsibility. Unknown role of coach with9oin this?		Self audit – annual.		
Risk based approach	Specific policy for juniors / beginners / night rowing. Launching and river conditions 'considered by key club individuals. All incidents to be entered into the incident book.	Led by safety policy – see comments.	Specific instructions to crews: Group launching / power boat and white board use.			Self audit – annual.		
Communication	All members to read and sign the safety policy. *(Presumably this means that they agree to abide by it?)*	Safety policy distributed to all members. Annual talk.		All members emailed safety plan Information board has copies of plans available		Self audit – annual.		
Launch / on water management	Policy for specific events – i.e. Head of the river etcetera Policy for competence for power boat drivers Loose policy for Cox competent – focused on race capability PPE statement Night rowing policy	Stated within safety policy. All launch drivers must hold RYA L2. Have internal river flow limits and agreed limits with navigation Master. Limited night rowing activity.	Ops procedure in safety policy for some activity. Generic 'assessment' of site risks. Agreed operational practise. Communications	Cap / WSO/ Coach check launch conditions. Contact navigation master to report launch and check conditions. Communication breakdown possible.	Crews in /out on daylight rowing – especially senior single skulls.	Self audit – annual.		Senior crews / single skulls are possibly most exposed. I.e what happened if a single skull capsize on a winter morning – how are they checked in / out monitored?

Other comments:

- Is club literally meeting the requirements of the ARA code, because they re required to – or are they really taking a risk based approach to managing their activities? Look at the risk assessment presented to us.
- Is there a full and proper understanding of the implications of their duties and are they taking the consequence / are members of the club blind to some of the risks – i.e. kill cord / lifejackets – not showing drowning as a potential risk of immersion.
- Is the communication and monitoring effective enough? There seems to be reasonable policy statements about some of the risks – however there is as a question whether this is really risk led – it looks to be externally policy led. For example no notice is made to the local kids / conflict. However note are made about night rowing on match nights.
- Could the club deal with a breakdown or loss of one or more key member? or more importantly would another member of a club know / understand the policy and practise for junior launching if they were not there – or launch on the river in marginal conditions?
- Do the world-class coaches understand the implications of being a full time employee?
- Clarity of roles & responsibilities within club.

Appendix Six: Sample RoSPA Research Questionnaire

ROWING CLUB INTERVIEW

Region:

1. About the club	Club	
	Contact	
	Phone	
	Email	
	Date of Interview	
	Interviewer (RoSPA)	

2. Policy				
2.1 Do you have a club safety policy? PROMPT: Safety rules / club safety code Why?	YES [X] NO [ ] UNSURE [ ]			
2.2 What topics / activities does it cover? *PROMPT: Junior / Beginner / Night time / Capsize / Hypothermia / Buoyancy (personal and boat)*	1.	All activities	6.	
	2.	Junior	7.	
	3.	Seniors	8.	
	4.	Beginners	9.	
	5.	Buoyancy	10.	
2.3 What is the reasoning behind these areas being in your policy? *PROMPT: Can help by taking one or two examples - i.e. Junior / Capsize*	• Beginners need to be aimed at specifically. • It's generally any area that poses a risk.			
2.4 What guidance have you used in developing this policy? *PROMPT: WSC, FISA, ISO, further ARA guidance (note if they don't mention without prompt the WSC)*	WSC [X] FISA [ ] ISO [ ] FURTHER ARA GUIDANCE [X] OTHER: ▪ ARA's own safety policy. [ ] **Did not mention WSC without prompt**			

3. Organising	
3.1 Who is responsible in the club for managing water safety? *PROMPT: Club water safety advisor / Chair / Captain / Coaches / All / Other*	CLUB WSA [X] CHAIR [ ] CAPTAIN [ ] ALL [ ] COACHES [X] OTHER: [ ]
3.2 How do you decide upon these roles? (*We are looking for knowledge and experiences (and possible qualifications) - in addition to how this is in line with the risks)*	▪ Experience is key factor. ▪ Whoever is prepared to take on roles within committee.

4. Planning	
4.1 How do you identify risks in the club - activity / location? *Looking for the answer to cover both the sport-specific risks i.e. falling in / and location specific i.e. cold water / weir etc.*	▪ Club has been around for 100 years – so risks are common knowledge. ▪ Experience of coaches and members. ▪ Risk assessments of both sports risks and locations.
4.1.2 What guidance or help do you use to identify these risks? *PROMPT: WSC / Local experience / Incident history*	WSC [X] LOCAL EXPERIENCE [ ] INCIDENT HISTORY [ ] FISA [ ] OTHER ▪ Rowing Regatta Magazine.

4.2 Do you formally record these risks? *Closed response [Yes(1), No(2),Unsure (3)]*	YES [X] NO [ ] UNSURE [ ]
4.2.1 Open answer / additional comments to the above. *PROMPT: How they record them / why they don't / why unsure*	▪ Written copy of risk assessments and audits.
4.3 What triggers you to consider these risks, and how often is this? *PROMPT:* *Trigger - after an incident, safety audit, annual risk assessment;* *When - yearly, monthly, weekly, daily - this answer may be determined by the trigger mentioned in the first part.*	▪ They do a risk assessment for every regatta. ▪ Annual audits / risk assessments. ▪ History / experience.
4.4 What are the main risks at your club / main rowing location? *There is no right or wrong answer - looking for their opinion. Try to get a copy of assessment of risk.*	▪ Water level. ▪ Bridge on the stretch. ▪ Debris can be quite common.
4.5 How do you communicate these risks? *How do the club members become aware of the risks? Is this just confined to the committee / captains / WSA / new members?*	▪ Joiners / new members get copy of risks. ▪ White board by the launch highlights all the hazards for one particular day – members add to it should they see something. ▪ Coaches filter things down from committee to members.

5. Implementing & Monitoring	
5.1 What are the types of incidents you would record in your incident log book? PROMPT: Recordable / Reportable / All Does this include off-water incidents?	▪ Collisions, capsizes, incidents with other river uses. ▪ All off-water incidents should they cause harm, especially gym.
5.2 If there is a reportable incident how do club members find out and learn from it?	▪ Comes out in monthly policy meeting, the coaches then relay this to the crew.
5.3 Scenario: You say that all coaches must carry a throw line how do you ensure that they are aware of this and capable of doing this, and implement this. *Use information from ARA Audit* *If audit doesn't say this, instead of this question ask why all coaches do not carry throw lines.*	▪ Ages – try to influence coaches to use the throw lines, certain amount of trust but they are all well trained.
5.4 Do you think all your crews are competent in a capsize situation?	YES [X] NO [ ] UNSURE [ ]
5.4.1 How do you know this? Why are you unsure? Swimming competency / Capsize drill? / "Stay With the Boat" golden rule	▪ Capsize drills every two months.
5.5 If there is a capsize out of sight how would you become aware of this, and how would it be managed?	▪ Boat log – every boat logs out with times and location on river. ▪ No single rowing. ▪ There isn't really a location where rowers couldn't be seen. ▪ River not that wide.

5.6 What are the key differences between the way junior & beginner are managed vs. senior & experienced rowers? *Try and find out the reasoning behind any differences*	Juniors are made to wear lifejackets until they reach a certain level of competency. Certain degree of supervision extra to this.

6. Barriers to safety	
6.1 Are there improvements to your club's approach to safety you would like to make? Why?	Would benefit from an easier/lighter safety launch. ARA's recommendation is too heavy, other than this very happy with things.
6.2 What improvements or changes could / should be made to the ARA Water Safety code?	Nothing.
6.3 What are the key problems / barriers / issues to managing safety in your club?	▪ Sport is voluntary so can't really stop people doing things that are possibly unsafe. ▪ Getting people to obey the rules. ▪ VOLUNTARY is the biggest thing/issue.

7. Boat Buoyancy	
7.1 Do you take into account boat buoyancy when launching boats - or when putting them into potential swamping situations?	All boats are modern with buoyancy aids and drain covers are securely used – this is part of yearly audit.
7.2 Has your club been involved in a swamping?	Not really.
7.2.1 When a swamping occurs - do you record which boat was involved? *i.e. can you distinguish between a buoyant and non-buoyant boat in incident details?*	They would do if it happened.
7.3 When a capsize occurs do you record which boat was involved? *PROMPT: can you distinguish between a buoyant and non-buoyant boat in incident details?*	Yes.

8. Policy Drivers						
8.1 Do you agree or disagree with the following statement: "Safety in my club is driven more by direction from the ARA WSC than the in club risks" *Sliding scale of response - be VERY CLEAR about this statement, and the response! [SCALE: Strongly agree (1), Agree (2), Neutral (3), Disagree (4), Disagree strongly (5)]*	Strongly agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly disagree (5)
	☐	☐	☐	☐	X

8.2 Why? (to the above)	▪ The club is driven by experience of members and committee. ARA doesn't take a hands-on approach. ▪ Club has implemented things to ensure self-preservation.

9. Other Information	
9.1 Number of members in club *Willing to take an approx figure. The beginners are a proportion of the other 4 categories, i.e. how many of these are novice rowers?*	ADULT MALE 70 JUNIOR MALE 30 ADULE FEMALE 30 JUNIOR FEMALE 40 BEGINNERS (of the above) 30%
9.2 Risk assessment forms - copy requested?	YES ☐ Request denied ☐
9.3 Safety policy - copy requested?	YES ☐ Request denied ☐

Appendix Seven: Boat Buoyancy Report

Table of swamped water levels and corresponding swamped volumes

Sounding metres	Capacity metres³
0.000	0.000
0.010	0.002
0.020	0.010
0.030	0.026
0.040	0.047
0.050	0.073
0.060	0.106
0.070	0.144
0.080	0.186
0.090	0.230
0.100	0.276
0.110	0.326
0.120	0.376
0.130	0.429
0.140	0.483
0.150	0.538
0.160	0.594
0.170	0.651
0.180	0.709

Sounding metres	Capacity metres³
0.190	0.768
0.200	0.827
0.210	0.887
0.220	0.948
0.230	1.008
0.240	1.070
0.250	1.131
0.260	1.193
0.270	1.255
0.280	1.317
0.290	1.380
0.300	1.443
0.310	1.506
0.320	1.569
0.330	1.632
0.340	1.696
0.350	1.760
0.360	1.824
0.370	1.888
0.380	1.952

Terms of Reference

The research project to be known, as a review will firstly investigate:

1. The behaviour within rowing towards safety.
2. Whether the current ARA Water Safety Code (WSC) is fit for purpose

It will secondly make recommendations for the improvement of Rowing Safety in England.

Scope of research including assumptions and limitations

The review of Rowing Safety that will be undertaken by RoSPA is intended to provide guidance for the future of Rowing in England. This review is not in any way intended to be an investigation into or a review of any particular safety incidents that have happened in the past. The sole intention is to review current safety practices and guidance in Rowing and to produce recommendations in order that Rowing in England is as safe as possible and that as many people as possible can become involved in the sport in the knowledge that the safety procedures in the sport are as effective and robust as possible.

Pre-research terms of agreement confirmation

To ensure that all relevant parties are involved in the review prior to the commencement of the research, the following groups will be consulted to agree the final terms of reference and outcomes of the review and the process that is to be undertaken:
ARA
Mr and Mrs Stephen Blockley
The Parliamentary All Party Rowing Group
DCMS
Sport England

Proposed Structure and methodology

We will:

1. Review the WSC and the ARA's Water Safety Strategy (WSS) to assess its scope and range of guidance it offers
2. Assess its interaction and any disparity with international rules, regulations and guidance offered by both FISA (International Federation of Rowing Associations) collectively and from examples of other individual countries Rowing NGB guidance.
3. Compare this document to other similar such guidance offered by other sports NGB's.
4. Seek the views of others within the rowing community with a specific interest including the Amateur Rowing Association, Mr and Mrs Stephen Blockley, All Party Parliamentary Rowing Group and boat builders.

Audit of the WSC and Rowing Delivery organisations

We would audit the implementation of the WSC by clubs to ascertain both the range of application and the effectiveness of the code, through:

1. Site-specific audits
2. Postal survey
3. One-day workshop

It is essential that if lessons, if any are to be learned and successfully implemented that there is a complete 'buy in' from the rowing community to the process.

We propose at this stage to audit 4 clubs to get a good spread of activity. This will include: a large club with elite level athletes, a school, a University Club and a smaller local club.

Through this process we will cover the topic areas listed below:

1. Requirements within the ARA - WSC
The Code (rules)
Guidance
Additional guidance delivered to clubs supporting the WSC

2. Guidance within FISA and ISO and standards compliance
Guidance for Governing Bodies
Rules of racing
Other National Rowing Governing Bodies

3. Roles and responsibilities
Club structure and the responsibility for clubs for their members
The ARA's role in providing guidance, education and training

4. The practicalities of imposing an exact measurement of buoyancy
Who would perform measuring?
Who would regulate or enforce such a measurement (likely to be low tolerances within boat design and crew weight issues)?

5. The role of boat builders

6. The overall approach to safe practice
Maintaining and developing a culture of safe practice
The ARA's strategy

7. Risk Assessment and incident statistics
Specific risk assessment of incidents of immersion and hypothermia
Review of incident statistics