

INCIDENT REPORTING IN THE UK RECREATIONAL DIVING INDUSTRY

AN ASSESSMENT OF CURRENT PRACTICES AND POTENTIAL WAYS TO IMPROVE THEM

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“Data is defined as raw facts, without inherent meaning, used by humans and systems. Information is defined as data placed in context. Knowledge is Information applied to a particular situation.”



COGNITAS
Individual Supervisor Organisation

Improving Diver Safety by Challenging Current Practices and Encouraging a 'Just Culture'

CONTENTS

Executive Summary	3
Introduction	8
Section 1: Why Have an Incident Reporting System?	10
Section 2: Current Incident Reporting Systems	13
Section 3: Problems with any Open Reporting System	20
Section 4: Brief Summary of Questionnaire Results	22
Section 5: Shortfalls and Solutions within the Current System	28
Section 6: A Possible Solution	41
Section 7: Conclusions	46
Section 8: Recommendations	50

Annexes:

- A. BSAC Incident Report Form**
- B. HSE RIDDOR F2508**
- C. HSE RIDDOR F2508A**
- D. PADI Incident Report Form**
- E. RAF Flight Safety D-FSOR Form**
- F. RAF Flight Safety DCOR Form**
- G. CHIRP GA Incident Reporting Form**
- H. Summary of Comments from Various Sections of the Incident Questionnaire**

Executive Summary

In the last 20-30 years, recreational diving has evolved from a sport restricted to the dedicated, into a more mainstream sport almost universally accessible. This is especially the case when looking at technical and rebreather diving. Over the years the systems to capture incidents and provide lessons learned have improved, but there is still a wide disparity between what is reported and what occurs. For example, the statistics from the British Hyperbaric Association show that there are nearly 3.5 times the number of individual divers treated for DCI than incidents reported in the Annual BSAC report. A key aspect is that the diving demographic is now extremely fragmented, with multiple training agencies and self-directed learning becoming more prevalent.

Fundamentally, there is a need to change the attitude to reporting. This change needs to be addressed at all levels from the individual diver to those in supervisory roles (either instructor or at agency level).

Whilst the gathering of statistical information is of value, understanding the causality is of vital importance if the number and severity of future incidents is to be reduced. Therefore there are 2 requirements; good statistical data capture and a detailed narrative for lessons learned.

To ensure commonality of terms, a diving incident is defined as:

“Any event where an individual diver, or member of a diving project team, is injured, has an equipment failure, or conducts unsafe diving practices, either before, during or after an actual diving operation, that affects the safety of any team member, associated personnel, bystander or member of the public”.

Near-miss incidents should be reported in the same manner as actual incidents.

A Just Culture isn't just about having a reporting system, but rather a set of beliefs and duties that should be expected from all levels in the diving operation from diver through to organisation/agency. A Just Culture requires a cultural change from the present 'blame culture'. It requires divers to understand that they can report mistakes or errors and by doing so, diving safety can be improved if lessons can be identified and learned.

BSAC, the national governing body for diving in the UK, provide the current diving incident reporting capability. It has been running since for 46 years, but only in its current guise for the last 13. There are on average 400 reported incidents each year but only 25% of those come from divers, the remainder are from professional organisations. The form was last updated in March 2003.

There are a variety of diving incident reporting systems in use for diving; BSAC, DAN, PADI, DIMS and the 'Lessons Learned' sections of websites such as the 'I Learned About Diving from That' sub-forum of Yorkshire Divers.

They all have their uses but not one of them provides a complete solution covering both statistical and lessons learned to a level with the author believes should be considered best practice.

Reporting systems within Military and Civilian aviation were also examined to understand what processes or systems could be adopted within recreational diving to improve the capabilities of the current reporting system, or inform a new reporting system.

Open reporting systems require public confidence that they will improve safety, and provide both relevant and applicable information which could change the way their procedures or practices are conducted. However, the process by which this is achieved must also maintain the confidentiality of the reporter.

Understanding the numbers of incidents and dives taking place is essential if the level of risk is to be understood. Whilst the number fatalities is probably 100% accurate, the number of incidents and number of dives being undertaken falls well short of being understood. This has been proved by looking at other sources of data such as the diving internet forums, BHA data and using industrial incident:fatality ratios.

A questionnaire was published by Cognitas in June and ran for 2 months. Over this period 257 people submitted details but 20 of these have been removed from the statistical analysis for a variety of reasons. The split between agencies was 40:40:20 PADI:BSAC:Other. Within BSAC 98.8% of respondents were aware of the Incident Report and 50% had filled one in, but outside BSAC this dropped to 87% and 9.8% respectively. 19.8% of divers inside BSAC had never read the annual report and this figure rose to 23% outside of BSAC. On average more than 90% of respondents believed that divers could learn from reported & unreported incidents and near-miss incidents, but only 32.6% of divers who were involved in an incident actually reported their incidents to the BSAC. Reasons for non-reporting were varied but the major factor was 'trivial incident that did not require reporting', followed by 'didn't think it would do any good' and in third place 'Could not be bothered'. Promoting the benefits of reporting at all levels and making reporting easier should improve these figures.

Using feedback from the questionnaire and knowledge about other reporting systems, the author has proposed a series of options which could be adopted by a reporting organisation using the same level of capture to fill some of the capability gaps which the author believes currently exist. These include:

- Ascertain the numbers and types of diving taking place in the UK and by UK divers to allow risk levels to be better understood.
- Better promotion of reporting of incident reporting and incident reports by training agencies.
- Collect more evidence from agencies/organisations such as the BHA, military recreational diving, HSE reporting and internet forums.

- Investigate whether families would be happy about publicising details behind fatality reports as they are more likely to have a greater impact than generics in an annual report.
- Provide a true lessons learned capability where specific details are available to show 'why' an incident occurred and not just 'what' happened. This 'why' may have started much before the actual incident occurred.
- Improve the level of access to BSAC data to allow those outside BSAC to understand more of the 'why'. This is especially true for fatality reports.
- Update the content and format of incident reports to improve better data capture of all reports, but especially technical & CCR diving incidents, human factors, equipment and non-technical factors.
- Improve the dissemination of important diving information outside of the agency or organisation which has detected or recognised the issue.
- Enhance the role and capability of the BDSG such that they can operate as Subject Matter Experts (SMEs) to the reporting agency.
- Provide an independent advisor to the capture, analysis and reporting processes who has no link to a training agency.
- Show positive feedback to the diving population that reporting has had an effect. The one normally cited by BSAC is the Buoyancy Workshop but this example is potentially flawed for a variety of reasons.

There is a need for a single focal point for all current safety, incident reporting & management practices, dive and hyperbaric medicine best practice and related reference material along with details of diver training standards. Consequently, the author has created a website, the Diving Incident and Safety Resource Centre (www.disrc.com), which will allow much more detail keyword searches and the ability to provide updates to subscribers.

A new reporting system involving a revised database capture process is proposed which would be managed by an independent company/organisation who would take responsibility for the collation, analysis and reporting of diving incidents. They would provide true agency independence working for and with the diving community.

Having an independent organisation would allow true independence across all agencies without the issues of an 'agency banner', may improve support from other training agencies and non-BSAC divers who perceive that the current system is a BSAC system, would allow systems to be developed more easily outside of the constraints of BSAC and finally data from this system could be fed into the BSAC system to allow BSAC to continue with their statistical evidence gathering if they wished.

There are some negative aspects to such a proposal which have been identified: 2 reporting systems which may lead to reduced overall reporting or duplicate reporting; it would take time to build up the working relationships with the external agencies to the same level which BSAC currently enjoys. External agency support, including HSE, is essential; it would take time to gain credibility and

recognition within the diving population, especially within BSAC; finally, it would require confidence that the independent organisation was in this for the long term and not out to make a 'quick buck'.

Recommendations

It is recommended that:

General

The members of the BDSG discuss frankly the contents of this paper at the next meeting and provide feedback to the author of this report before 7 Oct 2010.

Training agencies include incident reporting in all of their courses highlighting the benefits of improved incident reporting and lessons learned capabilities.

Divers, including instructors, report all incidents where there is likely to be a lesson learned, this especially applies to near-miss incidents which may be considered trivial at the time, but could have had severe consequences if not corrected.

Agency organisational and supervisory chains actively promote a 'Just Culture' to improve the numbers of, and quality of, reports fed back through the reporting system.

A process is put in place which allows the dissemination of important/safety of life issues to be passed between training agencies and the diving population which maintains confidentiality of the initiator. Use of the DISRC, with an email notification, should be considered.

Cognitas continues with the development of the DISRC (www.disrc.com) to act as the single online focal point for all diving safety and incident management best practice and reference material.

A survey is run over a series of months to ascertain the demographics of UK diving.

Data Capture

The reporting organisation does more to capture the 'why' an incident occurs rather than just the 'what happened'.

The reporting organisations approaches the external agencies or organisations identified in section 5 to collect more data.

The reporting organisation modifies the capture form to improve initial data capture by providing a very basic capture process in both hard-copy and online versions.

The reporting organisation modifies the 'detailed' capture form or process to allow for areas which are lacking in coverage. These include CCR, technical, human factors and physiological issues. This could be done by producing a technical or CCR data capture annex.

The reporting organisation provides good examples of incident reports to use as best practice when completing reports.

The reporting organisation puts a process in place to allow more accurate incident and causality details to be captured, maybe through dialogue with the incident reporter.

Data Access and Analysis

The reporting organisation allows a higher level of access of incident data to all interested parties including other training organisations, instructors and individual divers whilst still maintaining confidentiality.

The reporting organisation looks at ways of revising the analysis process taking into account the revised captured data and output reporting requirements.

The BDSG, through the reporting organisation, discuss coroner's reports at the meetings with a view to publicising more detailed lessons learned reports.

The reporting organisation considers contacting families of diving fatalities with a view to getting their permission to publicise the lessons learned.

Output Reporting

The reporting organisation produces free monthly summary reports containing lessons learned, annual sub-totals and rolling annual totals to allow more timely information to be passed on to the diving community.

The reporting organisation produces free annual reports.

The reporting organisation produces detailed narratives in all reports allowing better lessons learned to be elucidated.

The reporting organisation provides a capability which allows users to select specific datasets upon which to search. These datasets could include date, location, equipment configuration, dive type etc.

Introduction

In the last 20-30 years, recreational diving has evolved from a sport restricted to the dedicated, into a more mainstream sport almost universally accessible. This is especially the case when looking at technical and rebreather diving. Over the years the systems to capture incidents and provide lessons learned have improved but there is still a wide disparity between what is reported and what occurs. For example, the statistics from the British Hyperbaric Association shows that there are nearly 3.5 times the number of individual divers treated for DCI than incidents reported in the Annual BSAC report.

A key aspect is that the diving demographic is now extremely fragmented, with multiple training agencies and self directed learning becoming more prevalent. Parallels could be drawn with a de-regulated commercial aviation industry, in which there is a need to be able to capture experiences from ANY source, distil that and feed the safety information back to the whole industry.

Recreational diving, outside of paid work (in whatever form), falls outside the remit of the HSE and, as such, there is very limited legislation to ensure that best practice is maintained or promoted. This can be interpreted as a positive, as a reduced legislature overhead is likely to increase take up of the sport in addition to reducing costs. However, it also means that those who undertake the sport, and do not have regular contact with instructors or training agency staff may not be aware of the latest best practices, and why they have been adopted. In addition, they are less likely to be aware of recent public incidents where safety lessons have been learned or identified. Notwithstanding that diving in a peer group or club provides a good learning opportunity as long as those divers report incidents within the group, providing the capability to learn from those lessons outside the group is also required.

The aim of this paper is ultimately to improve diver safety by improving the reporting process (by whatever means) and raising the awareness of the reporting process so that reports are submitted and lessons learned. Fundamentally, there is a need to change the attitude to reporting. This change needs to be addressed at all levels from the individual diver to those in supervisory roles (either instructor or at agency level). The author believes that without this change, whatever is done with the reporting system, the numbers of reports are unlikely to increase, and consequently the numbers of incidents will not be reduced.

Coupled with a background in Human Factors failings and incident assessments, and frustrated with the number of avoidable recreational diving incidents and accidents occurring each year, it was assessed that there was a need to examine current practices, and see what could be applied from other incident reporting processes, including civil and military aviation environments, to recreational diving and incident reporting and reporting. As part of this process an organisation named Cognitas emerged to provide some legitimacy to the research, and to provide potential solutions to the initial perceived weaknesses

in the current reporting system. The main aim of Cognitas is to “Improve Diver Safety by Challenging Current Practices and Encourage a 'Just Culture’”.

“A fresh view and new solutions are always welcome. We who have been involved with this issue for a long time may have lost the ability to innovate and improve.”

- A senior DAN analyst and researcher during correspondence with the author.

SECTION 1: WHY HAVE AN INCIDENT REPORTING SYSTEM?

In the past, many industries realised that incidents and accidents were occurring with an attendant loss in business revenue, either due to injury or death, or due to claims for compensation. Unfortunately, many of these incidents were repeat occurrences and therefore a means of identifying them, their causes and ways of improving systems such that the number of incidents was minimised or eradicated was required. Incident reporting systems were introduced, but in the main whilst they provided statistics to identify the main problem, they weren't too successful at identifying the root cause. James Reason's book 'Human Error' details many high profile accidents caused by human failings and whilst these incidents/accidents are in the industrial sector, the root causes identified can be applied to much smaller businesses or recreational sports. However, the motivation required to apply these lessons might be reduced. Reason showed that whilst the gathering of statistical information is of value, understanding the causality is of vital importance if the number and severity of future incidents is to be reduced to as low as possible.

Therefore incident reporting should provide two main outputs;

- Numerical data to conduct statistical analysis showing the frequency and type of incidents thereby highlighting areas which should be targeted by organisations in their system design/training, and
- Qualitative or narrative data which can be distributed showing the details leading to the occurrence and the occurrence itself thereby informing users/operators how to prevent further occurrences from taking place.

Lesson learned capabilities allow divers to solve problems when they have previously not encountered a situation because decision-making or problem solving is normally conducted by using past experiences applied to the current situation. That learning might be direct (where the user/operator has undertaken the activity themselves – training), or indirect (where they have learned from another person - anecdotes, training manuals etc), but in either case they need prior knowledge even if it doesn't exactly match the situation they are now in.

Definitions

To ensure that those reading this report have the same understanding of incident reporting, the term 'incident' needs to be defined so that there is a common understanding.

An accident is traditionally considered more severe in consequence or outcome than an incident, but within the scope of this report there is considered no difference. Therefore, all references throughout this document will be made to 'incident'. A diving incident is defined as:

“Any event where an individual diver, or member of a diving project team, is injured, has an equipment failure, or conducts unsafe diving practices, either

before, during or after an actual diving operation, that affects the safety of any team member, associated personnel, bystander or member of the public”.

As the incident involves practices or actions prior to the dive, due consideration of the system failings (supervision, training, publications/training manuals and education etc) must also be addressed.

A 'Near Miss' Incident is defined in the same way as a 'realised' incident, but the difference is whether there was an intervention to stop the incident occurring. However, it is recognised that an incident probably would have occurred without 'good luck' or a 3rd party intervention taking place.

The author, and many other safety management organisations, believe that all near-miss incidents should be recorded in exactly the same way as incidents as there can be as many lessons learned from near-miss incidents as actual incidents. Reporting of near-miss incidents will also give a good indication as to the true number of events occurring.

A 'Just Culture' is required to prevent tension or friction by balancing the need for honesty, the want to make diving operations safer, the need for appropriate discipline and accountability and finally, the requirement to ensure that those who make errors are not negatively criticised when they report their mistakes. A Just Culture isn't just about having a reporting system, but rather a set of beliefs and duties that should be expected from all levels in the diving operation from diver through to organisation/agency. For it to be successful, it is essential that:

- Organisations, supervisors and individuals acknowledge that human error is inevitable;
- Individuals must take a pro-active role in continued diver safety; and finally,
- Everyone, whatever their position in the chain, must know that they will be treated fairly, consistently and objectively by their organisation, agency, the authorities or the diving public at large in the event of an error occurring.

Establishing and maintaining an open and fair reporting atmosphere can and will be difficult; this was apparent from the aviation industry and is currently being faced by the medical professions. Agencies, supervisors and individuals at all levels should encourage frank, candid and honest open reporting to understand why an event happened, not just 'what happened'. In addition, every effort should be made to avoid action that may prevent future reporting. Reporting should become the norm, not the exception. It is important to note that when considering professionals or those instructing in a voluntary capacity, unpremeditated or inadvertent errors should not lead to disciplinary action, but a breach of professionalism may. (The HSE fully support this viewpoint and would rather have reports raised, even anonymously, than have 'unsafe' practices continue.¹)

¹ Telephone conversation Lock/Martins HSE, April 2010.

Ultimately, a Just Culture requires a culture change from the present 'blame culture'. It requires divers to understand that they can report mistakes or errors and by doing so, diving safety can be improved if lessons can be identified and learned. Identifying safety lessons learned is hard and requires the courage to admit that the diver has made a mistake. However, if the diver doesn't report that mistake and therefore someone can't read about it, it can almost be guaranteed that someone else will make that same mistake and maybe the consequences will be more severe.

SECTION 2: CURRENT INCIDENT REPORTING SYSTEMS

BSAC Diving Incident Reporting System

The BSAC is the National Governing Body (NGB) for Scuba Diving in the England as recognised by Sport England. Whilst BSAC speaks for, and liaises with, all the diving training agencies within the United Kingdom, The Scottish Sub Aqua Club and the Irish Underwater Council provide a focal point within their respective countries and should feed these back through to The BSAC for action/discussion. As part of the role as NGB, the BSAC manage the BSAC Diving Incident Reporting System, a capability which collates incident reports, through paper or electronically submitted reports, into a database, conducts analysis on this data and then produces an annual report detailing trends for incidents so that agencies can amend their training programmes accordingly. The BSAC Annual Report is considered by many as the industry standard when it comes to diving incident reporting.

The system has been running for 46 years and has collected somewhere in the region of 12 500 reports during this period and therefore trends on *reported incidents* over many years can be hypothesised. From a presentation at the DAN Fatality Workshop in 2009, it appears that the system in its current guise contains information back to 1997 with 4,799 reports covering this period. Reports from more than 30 years ago probably don't have much relevance to current training practices or equipment configurations. The format of the current incident report form was finalised in March 2003.

On average there are approximately 400 reports submitted each year to the BSAC. The majority of these reports are submitted from professional organisations such as the RNLI, the MCGA and recompression chambers with the remainder (approximately 25%) coming directly from divers themselves. However, it should be noted that approximately 7% of these reports come from recreational military diving incidents.

The BSAC system does not just concern itself with scuba diving incidents but also boat handling and snorkelling incidents as these are all within the remit of BSAC training. Of the 381 reported incidents in 2009, approximately 23% were classified as boating.

To enable an understanding of ways the current system could be improved, the process for submission and reporting on an incident within the current system is detailed below:

- 1a. Within a BSAC club: A confidential report is submitted either directly to the Safety Officer at BSAC or through the Diving Officer (DO) to the Safety Officer at BSAC. Professional organisations might also submit a report in addition to the diver report. This submission can be via hard-copy or email.

1b. Outside a BSAC club: A confidential report is submitted directly to the Safety Officer by the diver or the professional organisation. This submission can be via hard-copy or email.

2a. The report is received, anonymised and summarised by the BSAC Incidents Advisor. Some checking of details takes place where necessary. Cross checking with other reports takes place to ensure dual counting does not take place.

2b. Although reports concerning fatalities come through much more quickly, the investigation process can take a long time, but the BSAC council are made aware of the contents of these reports and BSAC staff are sometimes involved as SMEs during investigations.

3. The anonymised details are then transferred to a database and the original paper copies are kept for reference. The database is continually updated but once the cut off for publication of the annual paper report is reached, the report is 'frozen' and published. This manual system allows the reporting process to remain outside the requirements of the Data Protection Act.

4. The database is then used to create the statistical data and a summary report for each incident (which might be only a few lines long) is provided in the annual report which is then published just prior to the Annual BSAC Diving Officer's Conference (DOC). The database is continually updated with any new information (making its use of research actions as accurate as possible). Reports are not updated but if specific information is received that is deemed essential for dissemination, then agencies are contacted accordingly.

5. The BSAC provide a service for genuine research organisations who want data on diving incidents. Whilst this capability is not actively promoted by the BSAC, they have provided information to many serious research organisations looking for specific data on diving incidents.

The BSAC Incident Report and Annual Reports can be seen at <http://www.bsac.com//page.asp?section=1030§ionTitle=Diving+Incidents> and the form can be found at Annex A

BSAC also produce a document entitled 'Safe Dive Practices' which is a summary of what BSAC consider essential to ensure safe recreational diving. This document covers basic recreational, technical and CCR/SCR rebreather diving operations.

Other Diving Incident Reporting Systems

Health and Safety Executive (HSE) Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)

Whilst RIDDOR is not a diving incident reporting system per se, the HSE requires a RIDDOR form to be submitted if any incidents occur whilst divers are 'At Work'. This is a very basic system to capture incidents statistics and a means to identify

which incidents should be investigated further. Within the RIDDOR system there is no lessons learned capability accessible outside the HSE. Diving incidents are reported as ‘injuries or dangerous occurrence’ (F2508) or ‘case of a disease’ (F2508A) (decompression illness is listed as a notifiable disease) and there is limited opportunity to identify causality within the report form.

If an instructor has an incident at a managed dive site, then a report is normally submitted between the site management and the instructor. If an incident at a managed dive site occurs which requires external medical treatment (the casualty needs to go to hospital), then there is a requirement for the dive centre to report through RIDDOR. It should be noted that there is no direct link between RIDDOR and the BSAC Incident Reporting System and that many incidents which are reported through RIDDOR are not captured through the BSAC system.

RIDDOR forms can be downloaded from <https://www.hse.gov.uk/forms/incident/index.htm> or Annex B

PADI

PADI provides a reporting system which is for internal agency purposes and, as the form says, ‘this form is prepared in anticipation of litigation’ and is sent to their legal department. As such, this does not provide a tool to conduct ‘lessons learned’ or identify trends outside of PADI but appears to be used to ensure that all relevant PADI practices have been adhered to thereby reducing the possibility of litigation against the organisation.

An example of the PADI Professional Incident Report can be seen at www.aberdeenwatersports.com/.../PADI/PADIINCIDENTFORM.pdf or Annex C

DAN

DAN works with a network of approximately 500 hyperbaric chamber facilities in the United States and around the world, of which approximately 200 provide annual reports on decompression illness (DCI) injuries. From these reports, and the Medical Services Call Centres, they derive their data; there is no formal reporting process like the BSAC Incident Report System. Their reports detail a wide variety of occurrences in the recreational diving community, but do not represent the complete range of activity or incidents associated with diving. The report includes only data made available to DAN and, in most cases, only data that can be followed up with a manageable effort. The majority of data is therefore limited to residents or citizens of the United States or Canada.

In addition to the formalised reporting process, they capture data through Project Dive Exploration which is a prospective observational study of recreational diving dating back to 1995. In 2006 (for the 2008 report), over 1000 volunteer divers provided data from nearly 15 000 dives.

The level of detail when identifying causality is quite high but DAN is a commercial organisation with substantial funding and a requirement to ensure

premiums are charged accordingly as medical issues, including physiology, feature quite heavily in the annual report. In addition, due to the large numbers of reports, their datasets are statistically relevant.

The DAN annual diving reports can be downloaded from <http://www.diversalertnetwork.org/medical/report/index.asp>

DIMS

The Diving Incident Monitoring System (DIMS) is a small-scale incident reporting system organised by Richard Harris, based in Australia, looking into the causes of diving incidents, predominately in the Cave and Technical environments. The author of this report has had some correspondence with Richard and it appears that the survey is near completion but there has been limited take up with only 100 or so respondents over the 5 or so years that the survey has been running.

The DIMS website can be found at http://www.divedoc.net/diving_medicine/dims.asp

'I Learned About Diving From That' (ILADFT)

In 2007, using past experience from the Royal Air Force in open reporting of 'Human Factors' incidents, the author created an area within the Yorkshire Divers forum which allowed people to post details of their 'learning incidents', where things hadn't gone quite to plan but lessons could be passed on to others. The most important part was that divers would be able to post details of their experience safe in the knowledge that there would be no negative criticism of the incident and that constructive criticism was to be encouraged. Over the past 3 years there have been more than 300 reports posted in an open forum, however, the sub-section is only really known about by those members of the Yorkshire Divers forum.

There is no formal recording process or format and as such 'lessons learned' are difficult to search.

UK Military Recreational Diving

All recreational diving conducted within the military is under the auspices of the BSAC diving grades and any incidents are reported using a standard BSAC form. However, rather than being sent directly to the Safety Officer within BSAC, they are sent to Fleet Headquarters where military specific information is removed and the forms then forwarded to BSAC for inclusion in the Annual Report. Over the last few years, the number of reports submitted has dropped from an average of 35 to approximately 20.

Current Military and Civilian Aviation Reporting Systems

There is plenty of research which shows that introducing open and confidential reporting practices has improved the level of safety in both civil and military

aviation with a corresponding reduction in accidents and deaths. As such, it is worth considering those processes and seeing if they can be applied to recreational diving.

Defence Flight Safety Occurrence Report (D-FSOR) and Defence Confidential Occurrence Report (DCOR)

Incidents and accidents within Military Aviation have far reaching consequences, not just the loss of the aircraft or personnel involved, but also others on the ground or in the air, or potentially operational capability if the causes are not identified and mitigated. As such, appropriate levels of resource are applied to ensure that factors & causes are identified and removed. However, there are hazards or observations that have a less well-defined significance that are not always formally investigated. In order to gain a better understanding of the problems and contributory factors, it is therefore necessary to investigate these lower level events, before they are able to cause or contribute to a serious incident or accident in the future. There are 2 methods of reporting incidents in UK Military Aviation; the Defence Flight Safety Occurrence Report (D-FSOR) and the Defence Confidential Occurrence Report (DCOR).

The D-FSOR is the primary report for all flight safety occurrences and identifies the originator and passes up the command chain for comment.

The DCOR is the means by which an individual can raise an anonymous report on any flight safety related experience or observation, which is forwarded directly to Command Flight Safety Organisations.

Is it essential to create an environment where reports are submitted to capture events that are occurring which are not captured through normal working practices. Therefore those who submit a D-FSOR or DCOR are treated fairly under the 'Just Culture'.

There is obviously a financial burden for the work which is carried out by the DARS staff and they are funded by the MoD accordingly. However, fundamentally they are trying to engender a level of confidence that reporting is worthwhile and will achieve a change in practices if required.

Examples of D-FSOR and DCOR can be found at Annexes E and F respectively.

Confidential Human Factors Incident Reporting Programme (CHIRP)

The role of the CAA's Safety Regulation Group is to develop the UK world-class aviation safety environment, in partnership with industry, by driving continuous improvements in aviation safety in the UK and, in partnership with the European Aviation Safety Agency (EASA), across Europe. Whilst the majority of reporting comes through formal reporting channels (the same as the D-FSOR in the military), there are a number of incidents which are reported through a confidential system, the CHIRP. The CHIRP covers a variety of areas within civil aviation but the one most applicable to diving is General Aviation as those who

fly as 'private pilots' are in the main volunteers. The author visited the headquarters of CHIRP located on the QinetiQ site in Farnborough to discuss with the CEO the issues of starting up a confidential reporting system and the challenges being faced. CHIRP has been running for approximately 12 years and is funded by the CAA with a staff of 4 to cover all areas and not just the GA section which we discussed.

The reporting process is confidential and the way that this is achieved is by ensuring only the reporter knows who the subject of the report is. This means they are not covered by the Data Protection Act (DPA). This is accomplished by the following process:

- A report is submitted securely to CHIRP. On the report is a field 'No, I do not require a response from CHIRP' which means that CHIRP will not contact the reporter for clarification of details. Instead, the report is allocated a serial and entered onto the system.
- If authorised, CHIRP contact the reporter to ensure that all details are correct and the reporter's anonymity is maintained in the text that is formulated for the database. This discussion also elicits any lessons learned.
- The reporter is given a serial number for the report and then all links with the reporter's identity are removed from the report before posting to the database
- Once on the database, the only way to amend report details is to put an 'All Points Bulletin' asking for the reporter linked to report XXX to contact CHIRP.
- This anonymity means that if there are issues (operational, commercial or personal) then they cannot be followed back to the reporter.

On average CHIRP get approximately 80 GA reports per year. This is contrast to the 1000's which are reported through the mandatory CAA reporting process.

CHIRP has several teams of special advisors on whom they can call if there are potential issues regarding a report which has been raised. The advisory teams and personnel working on them are listed on the CHIRP website.

A copy of the CHIRP GA incident report is at Annex G and an example of a CHIRP monthly summary can be found at www.chirp.co.uk

SUMMARY

There are a variety of diving incident reporting systems in use for diving; BSAC, DAN, PADI, DIMS and the 'Lessons Learned' sections of websites such as the 'I Learned About Diving from That' sub-forum of Yorkshire Divers.

They all have their uses but not one of them provides a complete solution covering both statistical and lessons learned to a level with the author believes should be considered best practice.

Reporting systems within Military and Civilian aviation were also examined to understand what processes or systems could be adopted within recreational diving to improve the capabilities of the current reporting system, or inform a new reporting system.

SECTION 3: PROBLEMS WITH ANY OPEN REPORTING SYSTEM

For an open reporting system to achieve its aims, those who are going to submit must trust that the system will work and that something will come from the submission of their report. They must also trust that the organisational hierarchy will accept that human errors occur and will be dealt with fairly and justly; this can be summarised as a 'Just Culture' as detailed above. Obviously negligence or malicious intent are outside the scope of a 'Just Culture'.

Introducing a new system, or revising an existing system, will always meet with resistance due to human nature. The challenge will be to show that there will be benefits and that improvements can be made, especially when those changes are not instant. Getting organisational and supervisory level buy-in is also essential as without it, changes will not occur.

Number of Incidents and Number of Dives

One of the issues regarding any incident reporting process is understanding the magnitude of the problem. To do this we need to ascertain how many dives are taking place, and of those, how many end up as an incident or an accident.

Unfortunately due to the diversity of diving locations, clubs, hard-boat operations and individuals diving in the UK and overseas, this number is probably not accurately known. Two surveys which the author has been able to find are the MCA National Watersports Omnibus Report from 2005 and the BSAC Diver Survey from 2007.

The MCA report assesses there are nearly 700,000 divers in the UK and 2.8 millions dives are conducted each year which has been extrapolated from a sample size of 6000-12000 respondents covering all forms of water-sports but only 49 of those respondents conducted leisure diving. There are many problems with this data set looking at some of the reports produced e.g. 0% of leisure diving takes place in the Orkneys, there are no inland leisure scuba activities taking place in the South West of England (Vobster quay & NDAC). The results therefore should be treated with extreme scepticism.

The 2007 BSAC Diver Survey report will be covered in more detail later.

The BSAC believes that they are capturing 99.99% of all fatalities is being captured by the BSAC through its contacts within the MCGA, RNLI, emergency services and dive clubs. However, the number of incidents reported falls well short of those occurring and the author assesses probably somewhere in the order of a magnitude less than that occurring. The reasons for this statement are as follows:

- James Reason in his book 'Human Error' references work done in Industrial Safety analysis where the ratio of reportable incidents to fatalities was 600:1 – this figure could mean that up to 24 000 reportable diving incidents are taking place.

- The British Hyperbaric Association (BHA) over the last 5 years has recorded on average 355 divers given recompression treatment (many requiring more than 1 recompression treatment) within its membership. They have also suggested that the London Diving Chamber treats on average 50-60 divers per year. This means there are approximately 3.5 times the number of diver recompressions taking place than are reported through the BSAC Incident Reporting System. The rate of 'false' recompressions (where the injury is not DCI) is around 1% of treatments.
- For the last 3 years, the Yorkshire Divers forum has had a 'I Learned About Diving from That' sub-forum running and there are more than 300 original threads posted. Many of these threads have other participants reporting their lessons learned without starting a new thread. The author is not sure how many are reported but plans to carry out further research to ascertain how many users who have submitted reports to ILADFT also reported the incident to the BSAC. This will be completed before mid October 2010.
- The RIDDOR reporting system through the HSE has on average 12.2 incidents per year reported.
- The BSAC Diving Incident Form is used by other training agencies such as the SAA to capture data. In 2009, the SAA started to provide the BSAC with their incident data. It is not known if any other agencies capture data using the same form but do not forward it to the BSAC for inclusion in their annual report. If this is the case, then there is another batch of data which could be included.

SUMMARY

Open reporting systems require public confidence that they will improve safety, and provide both relevant and applicable information which could change the way their procedures or practices are conducted. However, the process by which this is achieved must also maintain the confidentiality of the reporter.

Understanding the numbers of incidents and dives taking place is essential if the level of risk is to be understood. Whilst the number of fatalities is probably 100% accurate, the number of incidents and number of dives being undertaken falls well short of being understood. This has been proved by looking at other sources of data such as the diving internet forums, BHA data and using industrial incident:fatality ratios.

SECTION 4: BRIEF SUMMARY OF QUESTIONNAIRE RESULTS

To ascertain whether there was a problem with the current reporting system, a questionnaire was put together and published online. Notwithstanding the view by some that this was a biased questionnaire, the capabilities of a new system could be incorporated into an existing system if there is a want or a need. The results of the questionnaire are available to download from the Cognitas website, www.cognitas.org.uk, so that anyone can conduct their own analysis of the data collected if they wish. The only fields that have been removed are initials, year of birth and location to preserve the identity of those who have submitted data. In addition, any comments made in the text fields which could have identified the user have also been removed.

Number of Respondents

There were 257 submissions. 4 have been discounted as being invalid (2 x 110+ year old divers, rude comments, 'test' entry to review questionnaire again) and 16 have been removed from the statistical analysis as they are outside of the UK. However, the overseas respondents' comments have been left for examination as some of them are valid to all reporting systems and not just the BSAC Incident Reporting system.

The number of respondents is obviously very small for statistical significance. Those who filled in the form will come from a certain section of the diving community, and therefore the results could be assessed to be biased. Notwithstanding this, the comments made within the free text fields detail the arguments for and against the current report system and these provide a broad correlation about some of the concerns which the author has about the current system.

Split Between Agencies

The split between primary agencies of respondents was approximately 40:40:20 PADI:BSAC:other training agencies. The author believes that agency should not be included in an incident report for a couple of reasons. Firstly, as divers develop they take qualifications from other agencies (especially when moving to more technical diving) and therefore learn different skills; as such what skill was being 'used', or what agency was the diver 'operating under' when the incident occurred. Secondly, the application of an agency 'badge' means that trends within agencies might be 'blamed' when in-fact it might be the instructor rather than the agency which is to blame for the poor technique or skills. Comments have been left in the questionnaire with a view to tracking the instructors who have trained the individual to identify trends. Whilst this might provide agencies with useful data, it could be seen as 'Big Brother' by stealth. The author will raise this issue with the BDSG as there could be merit in this approach.

Awareness of the BSAC Incident Report Form and Annual Report

The author has tried to ascertain how many people inside and outside of BSAC used or were aware of the reporting system as one of the comments made in defence of the current system was that everyone knew about it, the process and its outputs.

Within BSAC, the numbers who were aware of the Incident Report (98.8%) and had filled one in (50.0%) were encouraging. However, the statistics for divers outside wasn't so positive for the same questions (87%, 9.8%). More worryingly, nearly one in five (19.8%) of divers had never read the report outside BSAC. One thing that was surprising was that whilst 100% of OD & SD were aware of the Incident Report and had seen one, 9.5% had never read the Annual Report. Outside of BSAC, the numbers who had read the Annual Report *decreased* (23% of divers outside BSAC had never read the annual report). It should be noted that those who completed the questionnaire are from a self-selecting population who might be more aware of the reporting system than the general diving population.

Medical Data

The questions regarding medical data were provided because it is perceived there is no common form available to all divers, recompression chambers, emergency services which provides an immediate data capture capability for a diving incident with a medical concern. The feedback in general was that this wasn't something that was required, however, the author and those behind Cognitas at the time of the questionnaire being produced, believe that having this capability would increase the robustness of the data captured during medical incidents. It would also allow better understanding of the trends of medical incidents and potentially allow better treatment. Prior to the questionnaire being issued, those involved within Cognitas at the time, developed a medical incident reporting form which could capture the majority of important medical information and be used as either an aide memoire for a more comprehensive report, or to go with the casualty. There were many responses saying that medical incident data is already captured by the dive manager; not all dives are conducted in a club fashion with many hard-boat or charter trips not having a dive manager. Providing such an immediate medical data capture form might fill this capability gap. The author will be approaching the training agencies, BHA & the medical services to further understand this requirement.

Report and Database Format

A major part of the questionnaire was to look at how data is submitted to the BSAC and whether this could be improved. In the current age of immediacy, if something can't be done now, then people are more likely not to do it. In addition, it is perceived by the author that the current format limits the ability of the system to provide more open access allowing those outside of BSAC to conduct analysis of the data themselves. In addition, having a system that allows keyword searches to be conducted of reports across multiple years within one database would be beneficial.

Since 2003, when the current format was produced, there has been an increase in the number of divers undertaking technical and CCR diving activities. The BSAC acknowledges that technical and CCR diving brings its own challenges when trying to identify lessons learned (as they might not be quite so straightforward as basic recreational diving) but the current form format does not allow enough specific data to be captured and this needs to be addressed.

The questionnaire had options showing additional reporting processes/possibilities and these included:

- Human Factors Error Information
- Diver Physiology Information
- Technical Information
- Equipment Information.

Some comments from this section are reproduced at Annex I.

Type of Diving Being Conducted

This section is probably the most heavily skewed because the results were predominately generated from internet forum links, Facebook links and dive magazine internet sites. This means that those who filled in the questionnaire are more likely to be more technically orientated in their diving practices.

10.5% was mainly Overseas Diving, 21.0% was mainly UK Diving with 68.5% mainly UK with some overseas.

This shows that within the respondent population, more than 10% of the diving conducted was done overseas. The location of where an incident occurs does not change its ability to add to the statistics, nor reduce the ability of a lesson to be learned from it. Therefore more should be done to capture overseas incidents.

The percentage of divers who regularly conducted Air, Nitrox and Trimix diving was 17.7%, 75.0% and 36.4% respectively. The sums are greater than 100% as it was possible to select more than one option.

The number of divers who used CCR who completed the survey was 23.3%.

Unfortunately this section has shown that the experience level of the respondents was not aligned with the perceived demographic spread of UK divers. More information is required on the demographics of diving in the UK and this is covered in Section 5: Shortfalls and Solutions.

Having an Incident and then Reporting It.

Whilst 87.7% of respondents believed that divers could learn from currently reported incident reports, 91% believed that something could be learned from currently unreported incidents and 96% believed that near-miss reports would

provide a learning opportunity, 32.6% of divers who were involved in an incident reported their incidents to the BSAC.

There were 21.5% of respondents involved in an incident, 22.8% of respondents were involved in an incident but someone else reported it, and finally 23.7% of respondents had never had an incident. Overall, the number of divers who had not had an incident was a little surprising, especially when considering the number of dives that some of them had completed and the assumptions made in 'Numbers of Incidents' above, but this maybe because the definition of an incident (as above) was not clearly stated on the questionnaire.

The next section details the reasons behind why reports were not submitted.

Why Were Reports Not Submitted?

Trying to understand why reports are not submitted, especially from within the diver community is crucial to improve the numbers of reports received, thereby increasing the statistical significance of the report. 11 possible multiple-choice answers were provided for respondents to choose from, including a free text option 'other'. The reasons and split were:

Not applicable	6%
Trivial incident that did not require reporting	44%
Could not be bothered	28%
Too much paperwork	21%
Didn't think it would do any good	29%
Fear of ridicule from other divers	3%
Fear of ridicule from Supervisors / Instructors	3%
Fear of disciplinary action being taken against me	3%
Fear of disciplinary action being taken against someone else	3%
Commercial reasons	2%
Other reason for not reporting	36%

Again, the percentages can total more than 100% because it was possible to select more than one option.

Some of the 'Other reasons' cited in the free text section are at Annex H.

The major factor listed was 'trivial incident that did not require reporting'. Maybe rewording the requirement to submit an incident report if something could be learned from it would reduce this percentage as many of the incidents posted in the ILADFT section of Yorkshire Divers may appear to be trivial to someone but others can learn from them.

Unfortunately, the second most popular reason for not submitting a report was 'didn't think it would do any good'. Introducing and maintaining a 'Just Culture' is essential if this reason for not submitting a report is to be reduced. Divers need to know that their reports will be taken seriously and processes or systems changed or new ones adopted if there is deemed to be a problem.

The third largest reason was 'Could not be bothered'. Unfortunately, the author did not follow this up with a secondary questions, of "Why not?" However, if this attitude could be changed, then many more reports would likely be submitted.

RIDDOR Reporting

This section was included to ascertain the knowledge within the recreational diving community regarding the submission of RIDDOR reports. There were many respondents who held supervisory roles but did not know the difference between the 2 forms. In addition, there were comments that RIDDOR did not apply to recreational diving, however these came from BSAC divers where RIDDOR might not apply. However, if at a managed site and an incident occurred, the instructor would need to liaise with the site manager when submitting a report.

-“The large scale involvement of the HSE on incident reporting would lead to an unmanageable reporting system that would be unlikely to be used for all but the most serious incidents. The system needs to be simple and quick to use so that people log minor incidents and near misses as these are the predetermining factors for major incidents.” – Questionnaire comment

The idea isn't to have HSE reporting for all incident reports, they are only interested in those 'At Work', but rather simplify the process for reporting both areas at once.

Funding of a Reporting System

Cognitas realised that there will be a requirement to fund the development and operation of a National Incident Diving Database (NDID) and a series of questions were posed looking at how such a system could be funded. It must be emphasised that there is, or was, no plan to charge for access to the basic reporting provided under the NDID (monthly and annual reports) but that more complex analysis by organisations or individuals would be charged at a rate (as yet undefined). The options for funding and their returns were:

Yes	4%
Yes - But cost dependent	23%
No - It should be funded by diver training agencies	30%
No - it should be Government funded	6%
No - it should be free to all	38%

The detailed costs of running such a new service are unknown at the moment because the scope of what is required is also unknown. If this is to be taken forward then more detailed analysis will be undertaken.

The results show that within the limited number of respondents there is an understanding that an enhanced capability might cost money and that some would be likely to support it.

The author has also approached 2 training agencies about their views about supporting such a system and both were positive.

Software for Pre-dive Logging, Incident Logging and Reporting

This was an area which looked at whether there would be any interest in developing a tool, predominately for commercial operations, where an instructor would have many students details already known for their dive plan (required for HSE) and if an incident occurred, then details would be easily copied across to an incident report which would include planned dive profiles, gas mixes etc. The consensus from the feedback was that this was a commercially driven objective and had no place in Cognitas or incident reporting. Cognitas will not be taking this forward as the author believes that sufficient funding would be available from other sources to make an incident reporting process cost neutral.

SUMMARY

This section looked at the questionnaire which was published online by Cognitas Incident Management Limited. The aim of the questionnaire was to understand whether the preconceptions which the author and colleagues had were founded. Whilst the sample size is very small (253 for comments, 237 for statistics) and the questions have been in some cases viewed as biased, the comments provided within the free text fields have been very useful in providing both for and against a revised reporting system.

The full Excel sheet is available for download from the Cognitas website for offline analysis by interested parties.

SECTION 5 – SHORTFALLS AND SOLUTIONS WITHIN THE CURRENT SYSTEM

There is no doubt that the current reporting system has had a positive influence on safety and documenting trends but the author believes there is always room for improvement with any system. This section will describe the shortfalls which the author believes exist backed up by evidence from the questionnaire and other sources where possible. Where the author has suggested ‘reporting organisation’ this could mean BSAC as they currently provide this capability, or any other organisation charged with acting as the focal point for all incident data capture, analysis and reporting.

This section will also provide processes or solutions which could be adopted within the current reporting system; these solutions are also applicable to a system run by an external and independent organisation.

Many of the processes and solutions suggested come from military and civil aviation reporting systems. However, it is acknowledged that the drivers for reporting within a professional organisation are different to that of a recreational and/or amateur organisation. Notwithstanding this, there is no reason why the processes or systems could not be adopted within recreational diving.

Promoting a ‘Just Culture’

As stated above in Section 1, there is a need to promote and maintain a ‘Just Culture’ if reports are to be submitted. There have been examples of reports not being submitted because of fear of ridicule (from peers or instructors), information not being forwarded to HQ because of fear of investigation by HQ, “sometimes it isn’t worth putting your head above the parapet” and “didn’t think it would do any good”. Promotion of a ‘Just Culture’ is essential if candid and accurate reports are to be submitted by the diving population.

Ascertaining the Numbers of, and Types of, Diving Taking Place in the UK

From the BSAC Fatality Report available from the DAN website (2010 Diving Fatality Workshop), BSAC conducted a survey in 2007 involving 1000 divers at 35 sites and this data was backed up at conferences, dive shows and dive shops. The author has not been able to find the results of this survey on the BSAC site but there is reference to it in the public minutes from March 2008, where the contents of the presentation about the survey were to remain confidential. Understanding the spread of diving numbers and types is essential in understanding the level of risk being currently undertaken. Using the data from the presentation, the author is not convinced that some of the figures are indicative of the diving taking place in the UK e.g. it is stated that 4% of diving in 2007 in the UK was conducted by rebreather divers. The reason for this comment surrounds the number of OC divers at inland sites during the spring and summer months.

One method which the author proposes to calculate the numbers of, and types of, diving taking place in the UK is to conduct a survey over a 4 month period (May to September) or a complete year where:

1. The inland dive sites provide numbers of their gate entrances where the numbers of dives per day could be assumed to be 2. (This might be underestimating the number of dives as some divers conduct more than 2 at an inland site in one day). Additional questions could be asked at the entrance to the sort of diving (OC, CCR etc) that will be conducted.
2. Ask all BSAC DOs to provide a summary of the diving for the period in question. The author knows that many clubs keep annual logs of their diving so this should not be a major issue.
3. Ask all hardboat operators, maybe through the Professional Boatman's Association, to keep a copy of the diving sheets and enter them onto a website or forward them to the reporting organisation.

This would provide a much better indication of the sorts of diving taking place in the UK than a single weekend in the UK. Admittedly it would require some effort but the author has not seen the diving survey data so cannot accurately comment on its contents.

Better Promotion of Reporting of Incident Reporting and Incident Reports

As has been shown in Section 4, the number of incidents reported is woefully short of the number of incidents occurring. The BSAC formally teach the incident reporting system from DL level onwards as that is when the supervisory role is introduced. However, there is no reason why incident reporting could not be introduced at an earlier stage as it possible that more junior divers could conduct a dive outside of a club environment and have no 'supervisory chain'. However, the greatest area where promotion could take place is in non-BSAC environments where the club and supervisory ethos is not as well developed as within the majority of BSAC clubs. This is especially the case for the lesser-experienced PADI divers who probably mainly dive outside of a club environment and overseas. Providing a lessons learned capability here would certainly have benefits. In addition, as divers become more experienced (deep technical and CCR diving), they are likely to move outside of a club environment.

During discussions on the Yorkshire Divers forum about incident reporting and the Cognitas questionnaire, one user (GarethJ) conducted a survey of all of the major UK recreational diver training agencies and government organisations such as the MCA or the Institute of Naval Medicine (INM) websites to see how proactive they were with regards to promoting the BSAC Incident Reporting System. Unfortunately the results were quite disappointing.

ANDI – No link to any form of incident reporting and nothing found when searching their website.

BDSG – Incidents tab at the top of the page, links to both BSAC (dead link) and HSE incident reporting, copies of the incident reporting form to download, positive encouragement to report all incidents recreational or commercial.

BHA – Links to BDSG. No further information on reporting incidents.

BSAC – No immediate link on the front page but ‘Report an Incident’ can be found on a drop-down if you know where to look or easily found using the search facility on the website.

DDRC – No information about submitting an incident report on front page.

GUE-UK – No link to any form of incident reporting and no search facility.

HSE - A section on the statutory requirements for reporting incidents at work (RIDDOR). There are also a whole host of other documents on incidents. On some pages the BSAC report is used as the defined reference standard.

IANTD UK – No link to any form of incident reporting and no search facility.

INM – Link to BDSG but no incident reporting per se.

RNLI – Recent incident reports in the news section but no link to reporting an incident.

MCA - The MCA provide links to the BSAC incident report & the BDSG. They also provide their own incident report of incidents handled by the MCA.

PADI UK - There is no link to any form of incident reporting. The Search facility doesn’t bring up any hits either.

PSAI - There is no link to any form of incident reporting. There is no Search facility.

TDI & SDI - There is no link to any form of incident reporting. There is no Search facility.

SAA - No immediate direct on screen link, however links to the BDSG are stated. They also have their own report (2008) but it is not immediately apparent on this website.

SSAC - No immediate direct on screen link, however quickly found with the search facility. They refer back to the BSAC site & the incident report section.

SSI - There is no link to any form of incident reporting. The Search facility doesn’t bring up any hits either.

Considering that all of the agencies are members of the BDSG whose main aim is the promotion of safety within recreational diving, this level of overt support for

the BSAC reporting falls well short of best practice. Why do none of the agencies (including BSAC) have a link to the BSAC Incident Report form on their front page? One of the criticisms of the Cognitas proposals was “Why provide a new solution, would it not be better to promote the existing system to all divers?” To a certain extent this was a valid argument, however, reasons for a non-agency aligned reporting process are discussed later.

As far as the author is aware, none of the PADI courses mention the BSAC Incident Report in their syllabus and none of the technical agencies teach it as a core requirement. However, there is nothing to stop an instructor from mentioning it during the course they are teaching. To ensure that all levels of divers, from the most junior to the most senior, could learn from others’ mistakes, there needs to be active promotion of a reporting system by all agencies within all courses. Those with the most to learn from others’ incidents are the most junior because of their limited experience and therefore limited ability to problem solve situations which they have not previously encountered. However, more senior divers are known to become more complacent and sometimes need a ‘wake-up’ call to show what can happen if procedures are shortcut is required.

In addition to the above, the author conducted a series of searches using Google to see how easy it would be to find out about submitting a BSAC Incident Report.

“how to report a diving accident” – 5th hit was a link to the annual report page. The 4th page shows MoD Joint Services ‘BSAC’ Incident Report (report submitted to MoD not BSAC). Not until page 7 is the BSAC ‘Incident Reporting’ home page listed.

However, the following results were very encouraging.

“how to report a diving incident” – BSAC ‘Incident Reporting’ home page gave 1st and 2nd hit in Google.

“diving incident report form” - BSAC ‘Incident Reporting’ home page again gave 1st and 2nd hit.

“how to submit a diving incident report form” – first 3 hits on page 1.

Finally, considering that more than 10% of respondent’s diving is conducted overseas, more should be done to make it easier to report incidents overseas. Especially when considering that a large percentage of UK divers are warm water divers.

Collecting all Evidence Available for Trends Analysis and Lessons Learned

HSE Reporting. As explained above, RIDDOR is not a diving incident report form per se, but there could be lessons learned/information gathered if the forms were anonymised by the HSE and forwarded to the BSAC.

Internet Forums. Many of the forums now have lessons learned sub-sections (Yorkshire Divers, Rebreather World, Finstrokes to name but a few) and could easily be monitored by subscribing to the specific sub-forums with email alerts. The author, since starting on this process of promoting a revised reporting system, has been contacting the reporters on some postings to ask if they have reported these incidents to the BSAC as he believes there are lessons to be learned from the postings. The aim should be that reports can be reported on the forum to elicit discussion but also submit a report to the reporting organisation to inform the central repository.

Recompression Chambers. From the statistics received from the BHA, there are nearly 3.5 times as many recompressions taking place at BHA recompression chambers to treat DCI as those reported through the BSAC Incident Reporting system. There should be a more concerted effort to bring chamber operators into the reporting process to capture those additional incidents which are not captured by the BSAC system.

“That the MCA National Diving Liaison officer (NDLO) establishes, via the British Hyperbaric Association (BHA) and Institute of Naval Medicine (INM), the overall annual frequency of UK decompression chamber usage resulting from diving incidents...”

The above quote comes from the MCA Prevention Report 3/04 but it is not known if this has been acted upon and whether the statistics are passed to BSAC. In addition to the above, there are many other recommendations made which the author is not aware have been completed. The full report is available at [www.mcga.gov.uk/c4mca/prevention_report_diving - 28082004_pwb.pdf](http://www.mcga.gov.uk/c4mca/prevention_report_diving_-_28082004_pwb.pdf)

London Diving Chamber iPhone Application. The London Diving Chamber (LDC) have produced a very basic incident reporting tool for the iPhone. Further research by the author will investigate the success of this application.

All of the above show that there are incidents which are occurring but are potentially not being captured by the BSAC reporting system. Whilst some BSAC HQ staff may not think that the overall trends will change if these additional incidents are captured and therefore why bother capturing them, the author of this paper does not believe this is the case and the answer cannot be known until this data is captured and analysed.

Lack of a True Lessons Learned Capability

Whilst the staff at BSAC with whom the author has spoken have said that the Annual Incident Report provides a lessons learned capability, the level of detail contained within the Annual Report is missing many specifics which allows the reader to understand ‘why’ an incident developed into what it did.

BSAC do produce a monthly document entitled ‘Safety Talk’ which has some ‘lessons learned’ items. Whilst this is very much welcomed by the author, the majority of entries are from senior BSAC members expanding on Safe Diving

Practices rather than 'run-of-the-mill' divers who have had an incident. In addition, unless you are a BSAC member, know about 'Safety Talk' or subscribe to the newsletter, the existence of the document isn't immediately apparent.

It is accepted that providing a true lessons learned capability would entail more work on the part of the reporting organisation in collating and checking the reports, but without the detail, a true lessons learned capability is lost. A two-way dialogue with the reporter ensures that the correct level of detail is included. This conversation does not conclude until both CHIRP and the reporter are content with the anonymity and lessons learned contained within the report. At that point the report is then added to the repository and published.

The level of detail that comes into BSAC when a report is submitted is not known, but if reports are missing details (especially from the first person) may be the reason is that divers do not have access to good examples of reports. The only reports they might be able to refer to are those in the annual report and consequently only provide that limited level of detail. Examples of good quality reports could be provided to show what sort of level of detail is really required. Improving the initial report submitted would mean that the interaction between the reporting agency and the reporter would also be reduced.

It has been stated by BSAC that the majority of reports do not come from divers themselves (only approximately 25% do), therefore the level of detail to make a good lessons learned report might not be known. However, if the number of diver reporters was increased, the number of reports from which lessons learned could be distilled would also be increased. In addition, providing an easy to use and quick interface might allow more details to be submitted by external organisations.

The current report forms do not cover technical and CCR diving in enough detail. Therefore, much more information is required to be captured when looking at technical and CCR diving where unfortunately complacency drives many incidents. In these environments, details are essential if divers are to learn from other's mistakes especially when looking at potential OxTox and gas switching errors. To show the mismatch between reporting and consequences, 14% of fatalities (27) over the past 12 years have involved divers using rebreathers. 11 of those 27 involved divers not correctly switching the system on prior to entering the water and 4 had equipment failures.

To provide a true lessons learned capability, the reporter needs to list everything that is relevant to the dive in question prior to the incident and also what happened afterwards. Unfortunately many divers do not know what the lessons learned are which is why it is essential that a more experienced diver (and independent from that particular dive operation) looks over what has happened and discusses the incident with the diver in question to elicit the lessons learned. Sometimes having someone outside the same training organisation to query what happened can pay dividends by providing a fresh set of eyes to the problem.

Publicising Reports into Fatalities

From the DAN Fatalities Conference BSAC report, there have been 187 fatal incidents, 10 involved double fatalities, giving 197 total, in the UK since 1997.

The analysis of incidents within the report appears detailed and comprehensive and highlights some basic reasons why these fatalities have occurred and consequently, how they could have been prevented. In 57 cases there was insufficient evidence to ascertain the causality but the remaining 140 were analysed in detail. It is not known how much discussion takes place outside of BSAC with other training agencies when looking at causality and what can be done to prevent future fatal incidents from occurring. When queried about this by the author, BSAC responded with "We do discuss incidents with other governing bodies but we do not disclose any personal or confidential information." The author queried whether this was other governing bodies or other training agencies but no clarification was received.

The author is aware that in some cases families are approached with a view to publicising fatal incidents (Roz Lunn produced an article for Sport Diver approximately 2 years ago involving a double fatality, Leigh Bishop will be presenting at Eurotek 2010 on the death of Carl Spencer). It is not known whether BSAC approach families with a view to explaining that lessons might be passed on if they would allow more and specific details to be published. This would obviously have to be done with respect and decorum, but in many cases, if other divers knew what the detailed causality was, then further deaths might be reduced. (e.g. Shek Exley's 'Blueprint for Survival').

Finally, the author believes that the coroner's reports into diver fatalities, which are available to 'interested parties', should be discussed at the BDSG meetings; it could easily be argued that the BDSG is an interested party. The reason for this is because they are probably the most investigated of dive incidents and would allow training agencies to identify and then more widely publicise specific issues or poor practices being undertaken.

Level of Access to the Data Submitted to BSAC

The author believes that opening up anonymised data reports to the wider instructor/training agency community would ensure that those who are in a position to pass on training information could use 'real world' examples of why things should be done a certain way or what happens if procedures are not followed. Humans respond much better to 'real world' examples rather than 'text book' examples as they can empathise with the diver in question. Showing how a 'real' diver created a problem by not following procedures, or taking a shortcut, and the consequences or the problem solving that followed, is likely to have a longer lasting effect than just saying the diver should do something because that is what the training manual says. However, this would mean that training agencies would have to positively accept that diving can be a risky sport with potential fatal consequences if skills are not practised and maintained to the level required. Shek Exley's booklet 'Blueprint for Survival' shows why certain

skills are essential within the cave diving/overhead environment and what the consequences of not following these rules would be using real examples of fatalities. The author has spoken to many cave divers who think that this is an excellent document as it exemplifies the consequences of not following correct procedures and drills.

Ensuring that the dataset was open would ensure that there is no potential for hiding incidents or reporting incidents in a form that is different to the report which was submitted. Whilst the author does not have any tangible evidence that this has occurred, speaking to divers during the course of his research, divers have mentioned that the outcome as published in the annual report is not that which was submitted: where that change occurred is not known.

Finally, having an open source capability would mean that agencies or organisations would not be able to skew results in their favour. There has already been at least one example of this where a company has used accident figures to promote their new safer equipment using incident data collected from a web forum.

Analysis within the Reports – Human Factors and non-Technical Factors

“The nature of many diving incidents is such that there is usually more than one cause or effect. Where this is the case the incident has been classified under the more appropriate cause or effect. For instance an incident involving a fast ascent, causing decompression illness, will be classified under ‘Decompression Incidents’.”

The above quote comes from the start of the BSAC 2009 Annual Incident Report and the author believes that not enough is being done to identify the ‘why’ something has happened rather than ‘what’ happened. Stating that a rapid ascent occurred is fine, but there is a need to understand why that ascent occurred? Lack of control of buoyancy, drysuit/wing dump valve stuck shut, dropped weights, task loaded trying to send dSMB up, the list goes on. Whilst the BSAC staff involved in the annual report generation may know the answers, they are not immediately apparent from the annual report or the statistics. In addition, providing statistics of how human factors (not just ergonomics) manifest themselves would also allow training agencies to target these specific issues during their training and again highlight the implications for failure to adhere to training protocols.

It is acknowledged that this analysis would take time and effort, but understanding the root cause of incidents is essential to preventing them in the future. The author believes that there is need to expand the question list within the current report form but make them more relevant; this will be covered in the section dealing with “Submission of Data (Format and Content)”.

Submission of Data (Format and Content)

Part of the questionnaire looked at what information should be included when submitting a report and what should be emphasised. The respondents to the questionnaire on the whole were happy with the current form and amount of

data captured with the BSAC incident report. The BSAC safety staff have acknowledged that technical and CCR diving bring their own problems when it comes to reporting. In addition, there is a distinct lack of Human Factors and Physiological information in the capture process.

CCR & Technical Diving. More should be done to address CCR and technical diving incident data capture requirements such as equipment configurations, dive plans, contingency plans, gas analysis and marking etc. As there is no standardised CCR configuration or technical equipment configuration, capturing this data might highlight trends on what is a good or bad configuration and equally as important, provide evidence to this effect. In addition, many CCR divers dive outside the BSAC club environment, therefore they are unlikely to make use of a 'club' based reporting system.

Human Factors. Human factors is not just about ergonomics but about how humans interact with and within a system. Diving is a system; the training, the supervision, the training organisation, the diver and the equipment and all need to be taken into account. Human Factors errors at the individual diver level can be divided into Active Failures (Skill Errors, Decision Errors, Perception Errors & Violation) and Latent Failures – Pre-condition for Unsafe Acts (Adverse Mental State, Adverse Physical State & Communication/Team Skills). By expanding these further and providing 'tick boxes' on the data capture process, then a better understanding of 'why' an incident occurred should be possible. The two other layers of a Human Factors Error classification process include Supervisory Influence and Organisation Influence but these would be very difficult to include in an incident capture form designed for recreational divers.

Physiological Information. The 2009 annual report shows that 57% of fatalities were over the age of 50 and makes comment about healthy lifestyles needing to be maintained irrespective of age. What about BMI or general health data in incident report capture? DAN captures BMI data within their reports but this might be because they are also an insurance company. The author acknowledges that BMI is not necessarily an exact indication of CV fitness or general health, but there is normally a good correlation with a sub-optimal healthy lifestyle if the BMI is excessive. Consideration should be given capturing height and weight in incident reports as is done by DAN.

Incident Report Data Capture Format. Whilst a large percentage of reports are submitted on the 4 page paper report, improving submission rates and data collection could be achieved by completely revising the interface through which the reporters send their information to BSAC. First off, providing a one-page 'aide memoire' would likely improve capture of incident data (can't be bothered'/'too much paperwork'). This can be either a single side of A4 reduced to A5 for use in wetnotes or similar, or a soft-copy on PDA/mobile phone/laptop. This is then used as a reference document when filling in the front-end for a database which allows 'contextual' questions to be used and this would potentially allow more pertinent data to be captured and at the same time reduce the time spent going through a complete report. This is discussed in

more detail in Section 6: A Possible Solution. Revising the format would also allow technical or CCR forms to be provided as annexes or targeted questions.

Output Report Generation

The annual report is published every year in time for the Diving Officer's Conference. The report is approximately 45-50 pages long and contains a summary of statistics plus a précis of the reports received by BSAC. The author is not aware of how many times the report is downloaded but would guess that it is not read all the way through by everyone who has downloaded it. The author assesses that producing a monthly summary of incidents with a rolling set of statistics (both in year and compared to previous years for the same month) would make the report more digestible to the diving population, who in the main, have relatively short attention spans for this sort of document. Having a reporting system based on a live database would make report generation much easier and quicker than currently experienced, would also allow anyone to request a report for the period of their choosing (not just annual or monthly) for whatever their reasons, and could also be generated for any field within the database e.g. number of CCR incidents where bailout was a factor. This capability would provide supervisors and instructors information about which areas need to be focussed upon or promoted during training. The current system might be capable of this but not to the general public or those outside the BSAC safety staff.

As the BSAC Annual Report has a cut-off date to allow the document to go to print, any information which comes in after this data is added to the repository but reports are not updated. BSAC have stated that despite this cut-off, they liaise with the other training agencies if anything important needs to be passed on, but that they do not update the annual reports. This has 2 consequences; if reports are submitted after the cut-off date they will not be included in that year's statistics and secondly any lessons learned from within those 'late' reports will not be passed on to the wider diving population.

Finally, the report is generated as a flat Acrobat PDF which means that keyword searches are limited. If a report was generated from a 'live' database then it would be easier to generate 'relevant' reports. E.g. all incidents involving CCR, or those where drysuit was used as primary buoyancy. This could aid instructors or supervisors by giving 'real-world' examples of when things have gone wrong, and solutions to how the problems were resolved.

Dissemination of Important Information to Wider Audiences

One example of this has been addressed and comes from an incident which was posted via a public forum and concerned a practice which had the potential for a fatal outcome. However, this does not mean that other incidents such as this have not occurred, just that they haven't been publically reported.

The author contacted the BSAC safety staff (but not via an official BSAC incident report form) and they investigated the incident. The outcome was that the

practice, as related in the forum, could be misunderstood with potential fatal results and to prevent this from occurring, any further training of this type was to cease. This notice was passed to the individuals involved but as far as the author of this report understands, no formal notification to all training/supervisory staff or other training agencies took place. This potentially means that other training staff or individuals, of a similar era, could be conducting the same flawed practices without realising the consequences or that they are doing something wrong.

Consequently, there should be a system in place that allows the immediate dissemination of important safety information inside and outside of the training agency which has detected or reported it; agency pride should not come into this when safety of life is at question. The use of an independent organisation, such as the BDSG, would alleviate the problem of an agency having to publicise an issue within its training organisation or procedures.

Enhance the Role and Capability of the British Safety Diving Group

Minutes of BDSG meetings are not available, so a detailed understanding of what is discussed or decided is not immediately apparent. Therefore, the author has only has comments from colleagues who have been there. The general feeling is that whilst the BDSG could have a major role to play in the promotion of safety within recreational diving, they appear to be lacking in any capability to do so. It is accepted that they are an advisory committee and therefore do not have any powers to 'force' changes to diving policy or direction but the discussions of the BDSG (where possible) should be made public.

In its current guise, the BDSG aspires to be the focal point of all safety information for recreational diving in the UK, and as such, there should be plenty of reference material and best practices listed on the BDSG website. However, the author has checked their website and found the following information which does not hold with this view:

- The majority of the 14 documents listed in the 'Safety Info' section are from 2005, with a few from 2007 and the most recent was published in October 2008.
- The link to the BSAC Incident Reporting page is dead and does not lead to the correct page on the BSAC website; the BSAC website was updated in September 2008.
- The news page has not been updated since October 2007.

In the MCA Prevention Report that was cited earlier, there were many actions placed on the BDSG by the MCA but it is not apparent that these have been completed. If they have, then there is nothing on the BDSG website to that effect.

The BDSG should act in a similar manner to the advisory committees within CHIRP who can provide advice to the reporting agency to ensure that a balanced view is provided in the lessons learned reports without any specific agency bias.

Independent Data Capture, Analysis and Reporting

One of the concerns the author has is that the current reporting system is seen as a BSAC only system even though BSAC go to some length to dispel this misnomer; however, some comments within the questionnaire do support this view. This preconception covers the promotion, the reporting, the analysis, and implementation of the detailed findings of the reports. Further examination is required to understand whether this view is valid across all agencies and all levels. However, the promotion of the system within training agencies or clubs outside of BSAC might go some way to alleviate this erroneous view, if it exists.

Having an independent organisation to provide oversight of incident reporting is seen in many organisations to be beneficial as it means they are not tied to any allegiances and can raise concerns without being bound by their own chain of command or hierarchy. Within recreational diving, this would mean that concerns could be raised without being bound by agency requirements or ethos. Having an 'independent' at the BDSG to provide a fresh, objective viewpoint might allow discussions to be raised without an 'agency banner' being shown. In addition, an action as simple as changing the name to something like the 'UK National Diving Incident Database' rather than the 'BSAC Diving Incident Report' would show that the data capture and reporting is wider than the BSAC. However, the author does understand that the current report is recognised by external organisations and is held in high esteem.

Reporting through an independent organisation also has advantages because it allows all agencies, supervisors or interested parties to have access to the same level of detail that BSAC currently has. The BSAC has a role to play as the national governing body for recreational scuba diving in the UK and it could be said that providing an annual report of the number and type of diving incidents lies within this area. However, the HSE are responsible for ensuring safety in commercial practices but they use a contractor (Connaught) to provide that statistical data capture and reporting.

Show Positive Feedback to the Diving Population

One of the reasons given in the questionnaire why divers do not submit reports is because they "Didn't think it would do any good". The problem with trying to address this is that you are trying to disprove a negative. If something didn't happen, is it because the diver learned and didn't make the mistake, or because they continued to make the mistake but didn't report it? One example that is normally quoted as being as a result of incident reporting is the introduction of the BSAC Buoyancy Workshop. This initiative is to be applauded but there are some concerns over using this as an example of reduced incidences of buoyant or uncontrolled ascents when looking at the statistics over the previous years.

Looking at the “Ascent” statistics over the last 7 years shows the following

Year	Incidents
2003	56
2004	80
2005	98
2006	99
2007	91
2008	65
2009	54

The 2009 report was accompanied by the comment *“Ascent’ related incidents have fallen dramatically over recent years and some of this decline is likely to be due to the focus that has been placed on this important area of diving skill.”*

Would the introduction of the Buoyancy and Trim Workshop in March 2009, half-way through the “Incident Year” have had such a significant impact on the reduction of the number of reported incidents? In addition, of those who had had buoyancy ascents, how many were BSAC divers?

Looking at the worst year, 2006, only 53% of “Ascent” incidents were attributed to poor buoyancy skills, and the report for that year concluded that *“Poor training and lack of skill are the only explanations.”*

SECTION 6 - A POSSIBLE SOLUTION

The following section details what the author thinks should be an ideal diving incident reporting solution.

Active Promotion of the Diving Incident and Safety Information

Create a website which:

1. Hosts or provides obvious links to reporting forms or database entry processes.
2. Hosts or links to all current and historical incident report data.
3. Hosts or links to best practice for medical treatment of diving injuries and diving medical incident management practices.
4. Hosts or links to reference and research material for all areas of diving, diving physiology, diving incident management, diving safety advice, agency training standards. (Training standards so that students know what should be taught and therefore if anything has been exceeded).
5. Provides the capability to actively promote safe diving practices through posters or leaflets which can be downloaded and printed locally or hosted on club websites.
6. Provides a capability to notify divers of important and safety-of-life issues through an email notification process.
7. Provides a capability to notify interested parties when updates to reports or lessons learned have been uploaded to the site.
8. Provides the opportunity for divers to leave feedback when something they have learned whilst reading a report has prevented something from occurring to them on a dive.

A website has already been created by the author, the Diving Incident and Safety Resource Centre (www.disrc.com), with such an aim in mind. There is still some way to go with regards to populating entries but as the framework has been completed, additional entries will not take much time to upload.

All agencies at all levels actively promote both incident reporting and lessons learned capabilities and how divers can learn from other's mistakes using real world examples.

Improve the role, visibility and capability of the British Safety Diving Group so that people know that they exist and what it does for the safety of diving in the UK.

Improved Data Capture, Data Analysis and Data Output

Involvement of Non-Agency Aligned Independent Advisor

The author firmly believes that an independent advisor/organisation should be involved in the management of any incident reporting process or system.

What was initially proposed by Cognitas was a reporting system that should be managed by an independent company who would take responsibility for the collation, analysis and reporting of diving incidents. They would provide true agency independence working for and with the diving community.

The independent organisation would make use of subject matter experts from all agencies in a similar fashion to the way CHIRP has advisory committees to ensure that any agency specific comments or guidance can be followed up.

Having an independent organisation would allow true independence across all agencies without the issues of an 'agency banner', may improve support from other training agencies and non-BSAC divers who perceive that the current system is a BSAC system, would allow systems to be developed more easily outside of the constraints of BSAC and finally data from this system could be fed into the BSAC system to allow BSAC to continue with their statistical evidence gathering if they wished.

However, there are several negatives to such an independent system; there would likely be 2 reporting systems, BSAC and the independent reporting system, which may lead to reduced overall reporting or duplicate reporting. Notwithstanding this, duplicates could be managed by looking at time/date and location of the incidents reported as there are unlikely to be 2 incidents at the same time in the same location which are unconnected. In addition, it would take time to build up the working relationships with the external agencies to the same level which BSAC currently enjoys. External agency support, including HSE, is essential. It would also take time to gain credibility and recognition within the diving population, especially within BSAC. Finally, it would require confidence that the independent organisation was in this for the long term and not out to make a 'quick buck'.

Such a step to an independent organisation might be too far for many in the diving community and as such an interim solution might involve the independent organisation as a collaborative venture. However, this would require buy-in from BSAC that the current system needs to be improved.

Involving an independent advisor would allow the possibility to raise issues across all agencies without an agency 'hat' on. However, it would also allow BSAC to maintain their credibility as the managers of the UK diving incident reporting system. With the involvement of an independent advisor, it is more likely to be seen as an independent reporting system thereby encouraging other agency or independent divers to submit reports. Finally, it would also allow existing contacts within the current reporting process to be maintained and new contacts to be made using the independent advisor.

However, there is still the potential that the system is seen as a BSAC system and as a consequence reporting is not improved.

Incident Data Capture Process

The author believes that the capture process needs to be revised to maximise the number of incidents reported, thereby improving the statistical validity of the data and increase the lessons learned output. This capture process needs to take into account diving which takes place at inland sites (such as managed sites, rivers, quarries), from RHIBs, from hard-boats, from the shore and overseas diving with UK divers. Notwithstanding the diverse nature of the environments, the capture requirements have some commonality – the process needs to be quick, easy and easily accessible.

The author proposes the following data capture process:

- A single one page A4 sheet which captures all of the immediate data requirements and acts as an aide memoire for later data transfer. This can be reduced and/or copied to wet-notes to allow use on a RHIB.
- Once able, the reporter visits a website which has a series of menus and questions and uses 'contextual questions' to target specific responses or options and the reporter uses the immediate capture form for reference. The website would be accessible and configured for use from mobile phones, PDAs, iPhones and laptops to allow remote data submission. In addition, something similar to the LDC iPhone application could be developed for iPhone, Android and Windows to allow immediate data entry.
- If the reporter does not want to visit a website to fill in an online report, they have 2 choices. Fill in a longer paper version of the online form and mail that to the reporting agency, or just send the single A4 sheet off.

Using a single sheet should allow the "couldn't be bothered" and "too much paperwork" potential reporter's incident data to be captured. As the author sees it, the current process probably isn't that much different as divers or incident managers will use some form of aide memoire to capture that data before transferring it to a pdf or paper version of the BSAC Incident Report Form. However, in this revised format, additional data, such as equipment configurations and technical/CCR requirements are captured.

The way the current form is structured, it is difficult to ascertain the root causes, as the form completion instructions say 'tick all those that apply'.

It should also be possible to configure the data capture process to allow sending of incident data to hyperbaric chambers but this would need further investigation to see if there is a need or a want. The author will be contacting the BHA to ascertain this requirement.

Finally, the capture process would be configured to allow 'At Work' (RIDDOR) reporting to be completed (if required) at the same time as normal incident reporting, thereby capturing those incidents which may have been previously

missed. RIDDOR reports for submission to the HSE would be produced in the reporting stage.

Incident Data Analysis

Once the report was received at the reporting agency, either online (webpage would copy data straight into a 'holding database') or via hard copy (which would be transferred to the 'holding database' manually), the reporting agency would look at the report and check that it is genuine, allocate a unique serial number, if all of the facts are clear, the report could be entered into the live database straight away.

If this is not the case, and the 'Please Do Not Contact Me' tick box which would be on the form is not ticked, the reporting agency contact the reporter to clarify details, identify the lessons learned, remove identifying data and agree the content of the report. Any other information from external sources (RNLI, HMCG etc) is also correlated at this stage.

Once the report is in an agreed format, the reporter is given that unique identifier, all personal contact details are removed from the report and the report is put into the 'live database'. The removal of personal details and issuance of a unique ID has three implications; only the reporter knows who the report refers to, no-one can contact the reporter in the future without them first contacting the reporting agency, and the requirements of the Data Protection Act are met.

Incident Data Output

As the data would be held in a SQL database, the outputs are pretty much limited by the imagination of the person making the query using the fields that are available. Whilst common queries can be configured via an easily understood User Interface e.g. monthly reports, annual reports, reports over defined time periods etc, the capability to produce more complex and targeted reports will also be possible such as CCR bailouts conducted over a set time period.

The author believes that standard outputs should be:

- Monthly summary reports of lessons learned and incidents reported. These are summaries not full blown reports with rolling statistics for the year and comparison to the previous 5 years. Producing monthly reports would allow more rapid turn around of relevant lessons learned rather than waiting potentially 12 months for it to appear in the current BSAC report. Finally, smaller documents would make the information easier to digest.
- Annual reports run 1 Jan – 31 Dec and would be produced mid-March.

To ensure the widest possible dissemination at this level of detail, these reports would be free to download in the same way as the current BSAC Annual Incident Reports.

Having a database report generation process with standard formats and already anonymised data will allow reports to be generated much more quickly.

Enhanced reporting would be available via an annual subscription basis. This would allow the additional infrastructure to be supported.

Funding Options

The author believes that there would be financial support from diver training agencies, inland dive sites, equipment manufacturers and interested and supportive individuals to sustain this enhanced capability.

Supporters would get access to the 'raw' anonymised data so that they would be able to conduct queries of their own looking at potential ways to improve their training or own personal techniques, methods or processes. Agencies and manufacturers would be seen to be supporting a safety initiative and would get feedback on whether their equipment or training could be improved. However, it would be made clear to all supporters of the reporting system that if their training or equipment was factually implicated in an incident, then they could not ask for that comment to be removed.

One method for the training agencies to provide financial support, would be to add a small sum to each certification card; this way those agencies with the most certifications would be supporting the system pro rata. An example of such a process is already present with PADI Project Aware where students pay an additional small sum to have Project AWARE graphics on their certification card.

SECTION 7: CONCLUSIONS

The aim of the paper was to understand what the current diving incident reporting system is capable of, what other incident reporting systems both inside and outside of recreational diving provide and how the current system can be developed. Ultimately, improving the reporting process (capture, analysis and reporting) will enhance the safety of divers who undertake recreational diving activities by better informing them of incidents which have occurred. This will allow them to apply lessons learned to their own diving activities.

The current reporting system is managed by the BSAC and they produce an annual report with basic details of the incidents and fatalities which have occurred over the previous year. On average there are approximately 400 incidents and 16 fatalities per year. However, less than 17% of reports come from civilian recreational divers, with the remainder coming from military recreational divers and professional organisations such as the MCA and RNLI.

Other reporting systems have been described, both inside and outside of the field of recreational diving and there are many lessons or processes which could be applied from these reporting systems. However, it is accepted that there would likely be a cost involved.

Problems within any open reporting system were described and the largest problem with any voluntary reporting system is getting those who have had incidents to report them. To improve reporting there needs to be a change in attitude to show that reporting can improve safety at the same time as ensuring that reporters are not mocked or criticised but provided with positive encouragement. Reporting must become the norm and not the exception. To facilitate this, a 'Just Culture' must be encouraged and developed at all levels within the diving community; from agency, through instructor, to the individual diver, in that order. In addition, understanding the baseline number of divers and the type of diving they undertake is essential to understand the level of risk being taken in the sport. This data does not currently exist in the public forum although the BSAC conducted a survey in 2007 of 1000 divers to try and ascertain the demographics of UK diving.

Whilst the details of all fatal incidents are believed to be captured by the BSAC Incident Reporting system, the author believes that the number of incidents occurring is likely to be at least an order of magnitude more than reported; this assessment comes from looking at a variety of other reporting systems both inside and outside the recreational diving world. BSAC believe that capturing this additional data would not alter the spread of the type of incidents occurring but the author is not convinced and the only way to understand whether there would be a change would be to capture more data. The increased numbers of reports with additional detail captured would have two benefits; improve the statistical significance of the current figures and provide a better lessons learned capability.

A questionnaire was set by Cognitas at the start of June 2010 and this ran for 2 months. There were 257 respondents (but only 237 were used for statistical assessment) and whilst the questions have been criticised as being biased towards a specific outcome, the free text boxes which were included provided an insight into the concerns that some have about the current reporting system. There were also quite a few comments supporting the BSAC Incident Reporting system in its current guise. Where comments had been left specifically criticising the layout and options, those sections have not had statistical analysis carried out on them, but they have been left to allow others to analyse the data if they wish.

One of the major aims of the questionnaire was to understand the reasons for not reporting incidents. Even though between 89% and 96% of divers thought it was a good idea (including reporting 'Near Miss incidents'), only 33.9% had actually reported an incident. The reasons for this lack of reporting are varied but the most 'popular' were "Trivial incident that did not require reporting", "Could not be bothered", "Didn't think it would do any good" and "Other".

During the public correspondence that took place following the publication of the questionnaire, a survey was conducted by one forum member looking at diver training agency and maritime/government agency/organisation promotion of recreational diving incident reporting. The results were very disappointing with the majority having no obvious link to the current BSAC reporting system or the links that were present were dead. This lack of promotion is especially disappointing considering that all are members of the BDSG whose aim is "to promote safe diving practices amongst the British sport diving community". It is also obvious that more needs to be done by the training agencies to promote incident reporting and lessons learned capabilities at all levels and in all courses if there is to be a change in reporting attitudes.

Using feedback from the questionnaire and knowledge about other reporting systems, the author has proposed a series of options which could be adopted by a reporting organisation using the same level of capture to fill some of the capability gaps which the author believes currently exist. These include:

- Ascertain the numbers and types of diving taking place in the UK and by UK divers to allow risk levels to be better understood.
- Better promotion of reporting of incident reporting and incident reports by training agencies.
- Collect more evidence from agencies/organisations such as the BHA, military recreational diving, HSE reporting and internet forums.
- Investigate whether families would be willing to have details behind fatality reports published as they are more likely to have a greater impact than generics in an annual report.
- Provide a true lessons learned capability where specific details are available to show 'why' an incident occurred and not just 'what'

happened. This 'why' may have started much before the actual incident occurred.

- Improve the level of access to BSAC data to allow those outside BSAC to understand more of the 'why'. This is especially true for fatality reports.
- Update the content and format of incident reports to improve better data capture of all reports, but especially technical & CCR diving incidents, human factors, equipment and non-technical factors.
- Improve the dissemination of important diving information outside of the agency or organisation which has detected or recognised the issue.
- Enhance the role and capability of the BDSG such that they can operate as SMEs to the reporting agency.
- Provide an independent advisor to the capture, analysis and reporting processes who has no link to a training agency.
- Show positive feedback to the diving population that reporting has had an effect. The one normally cited by BSAC is the Buoyancy Workshop but this example is potentially flawed for a variety of reasons.

As part of the research, the author has ascertained that there will likely be a funding requirement to pay for the enhanced capabilities. Data from the questionnaire has shown that there is potential support to fund such a venture and suggestions that this could be funded in part by diver training agencies by adding a small levy to the number of certifications taking place. This would show a pro-rata level of support to the amount of diving taking place.

There is a need for a single focal point for all current safety, incident reporting & management practices, dive and hyperbaric medicine best practice and reference material related along with details of diver training standards. Whilst the author believes that this should probably sit with the BDSG, their website is out of date and does not contain the level of detail which the author thinks should be present. Consequently, the author has created a website, the Diving Incident and Safety Resource Centre (www.disrc.com), which will allow much more detail keyword searches and the ability to provide updates to subscribers. Where possible information will be hosted on the DISRC, otherwise hyperlinks to, and summaries of, external documents will be provided. Whilst this site is in its infancy, the framework is complete and the population of the site can now start in earnest.

A new reporting system involving a revised database capture process managed by an independent organisation was proposed. This process would start with a basic incident data capture form (one side of A4) which could either be used as a basic submission or as an aide memoire for a more detailed submission. This enhanced submission would take place via an 'interactive' database with specifically targeted questions. The report would be sent to the reporting agency who could either enter it directly once anonymised and assigned a unique identifier or contact the reporter for clarification of details and lessons learned. It would then be entered into the 'live' database. This live database would allow basic monthly and annual reports to be generated easily and for free. More

complex searches, such as buoyant ascents where drysuit was primary source of buoyancy, could also be conducted. This enhanced capability would be available under a basic subscription service. Data to the same level as already captured by BSAC would be provided by the independent organisation free of charge to BSAC to ensure that they could continue with their statistical analysis.

There were advantages and disadvantages to such a system and these were expanded upon in Section 6.

If this option was considered a step too far for the diving community, then a collaborative venture with BSAC was also proposed.

SECTION 8: RECOMMENDATIONS

The author has produced this document as a means to highlight the potential shortfalls which exist within the current diving incident reporting system and to identify ways to improve it.

Recommendations are purely advisory and it would be up to the training agencies, government agencies, the BDSG, instructors, supervisors and individual divers to take these actions forward.

It is recommended that:

General

The members of the BDSG discuss frankly the contents of this paper at the next meeting and provide feedback to the author of this report before 7 Oct 2010.

Training agencies include incident reporting in all of their courses highlighting the benefits of improved incident reporting and lessons learned capabilities.

Divers, including instructors, report all incidents where there is likely to be a lesson learned. This especially applies to near-miss incidents which may be considered trivial at the time, but could have had severe consequences if not corrected.

Agency organisational and supervisory chains actively promote a 'Just Culture' to improve the numbers of, and quality of, reports fed back through the reporting system.

A process is put in place which allows the dissemination of important/safety of life issues to be passed between training agencies and the diving population whilst maintaining the confidentiality of the initiator. Use of the DISRC, with an email notification, should be considered.

Cognitas continues with the development of the DISRC (www.disrc.com) to act as the single online focal point for all diving safety and incident management best practice and reference material.

A survey is run over a series of months to ascertain the demographics of UK diving.

Data Capture

The reporting organisation does more to capture the 'why' an incident occurs rather than just the 'what happened'.

The reporting organisation approaches the external agencies or organisations identified in section 5 to collect more data.

The reporting organisation modifies the capture form to improve initial data capture by providing a very basic capture process in both hard-copy and online versions.

The reporting organisation modifies the 'detailed' capture form or process to allow for areas which are lacking in coverage. These include CCR, technical, human factors and physiological issues. This could be done by producing a technical or CCR data capture annex.

The reporting organisation provides good examples of incident reports to use as best practice when completing reports.

The reporting organisation puts a process in place to allow more accurate incident and causality details to be captured, maybe through dialogue with the incident reporter.

Data Access and Analysis

The reporting organisation allows a higher level of access of incident data to all interested parties including other training organisations, instructors and individual divers whilst still maintaining confidentiality.

The reporting organisation looks at ways of revising the analysis process taking into account the revised captured data and output reporting requirements.

The BDSG, through the reporting organisation, discuss coroner's reports with a view to publicising more detailed reports.

The reporting organisation considers contacting families of diving fatalities with a view to getting their permission to publicise the lessons learned.

Output Reporting

The reporting organisation produces free monthly summary reports containing lessons learned, annual sub-totals and rolling annual totals to allow more timely information to be passed on to the diving community.

The reporting organisation produces free annual reports.

The reporting organisation produces more detailed narratives in all reports allowing better lessons learned to be elicited.

The reporting organisation provides a capability which allows users to select specific datasets upon which to search. These datasets could include date, location, equipment configuration, dive type etc.