3.1. Chain of command and responsibilities
The chain of command suggested here is appropriate to fairly large organizations. In the case of small groups many of the responsibilities will be combined in one person, or, in the absence of superior authority, assumed communally by the members of the group. Even where no long chain of command exists, divers still must have clear-cut responsibilities for their own and each other’s safety. The outlined chain of command elaborated on here demonstrates the nature of the level of responsibility in the chain of command and is not intended to be a formal system, with every post filled by a different person, except in the larger institutes (See Table 2.1).

3.1.1. Corporate responsibility [Level 1]
Diving groups are operated by authority of the President, Director or Head of Department of a research establishment, university or polytechnic.

The President, Director or Head of Department is responsible for appointing in writing a suitable Diving Control Board or an Institute Diving Officer and for ensuring that adequate finance and material support is made available to train and operate the diving group safely. If diving legislation of a health and safety nature is enacted by a government to regulate diving at work, the President, Director or Head of Department is responsible for ensuring that the provisions of the acts are adhered to. In small groups, one person should take responsibility for ensuring that regulations are known and complied with.

3.1.2. Diving Control Board [Level 2]
An institute or university, or other corporate body may or may not have a Diving Control Board to set standards and work practices for the particular nature of the work and the local diving conditions. A Diving Control Board is most relevant in the case of a university or large institute where numerous component faculties or departments have differing interests and need to be represented. This group sits to formulate procedures and considers the best way to get the work done taking into account safety and operational conditions. This system of management is most commonly used in the USA and Canada.

In a university or institute where a great deal of diving is going on, the Diving Control Board should be as broadly based as possible so that the needs of all research diving groups are taken into consideration. The organization of the Diving Control Board can take whatever form best suits the size and experience of the research groups. In the case of an institute which is beginning diving operations, or for some other reason has little or no in-house expertise in scientific diving, the President, Director or Head of Department can appoint an external member of this Board, which can consist of the external member alone.

3.1.3. (a) Diving Officer [Level 2]
Where an institute or university does not appoint a Diving Control Board, the Director or representative of the corporate administration shall appoint a senior scientist as Institute/University Diving Officer. This person shall be the corporate officer responsible for the organization and policies of the diving programme.
This officer should co-ordinate the scientific programme of the group and ensure that the divers are properly trained, equipped and led, and that the necessary administration is dealt with.

This officer should have a good working knowledge of diving, but need not necessarily be in-date (4.9.1) with personal training.

This officer should appoint a Chief Diver and defer to the views of the latter on all matters concerning diving safety.

The Diving Officer may hold the post of Chief Diver, if he/she has the necessary qualifications and experience.

It is the responsibility of the Diving Officer to ensure that there is never any doubt about the chain of command.

It is the responsibility of the Diving Officer to take the initiative to produce, with the Chief Diver and the Scientific Project Leader, a joint operational instruction relating to each project. This will detail scientific objectives, operational procedures and safety precautions.

The post of Institute Diving Officer is not identical with the post of Diving Supervisor who is often the specified person in charge of diving operations in some commercial diving regulations. In a research context the senior person responsible for overall conduct of diving operations should have a general knowledge of the scientific programmes and requirements and also have sufficient seniority to appoint and report upon personnel. The Chief Diver may have insufficient seniority from this point of view. The Institute Diving Officer, thus, has the responsibility to comply with relevant government diving regulations in organizing diving operations, and the President, Head of Department or Director is responsible for the institute or university to ensure that this happens.

3.1.3. (b) Diving Officer [Level 3]
Where an institute or university has created a Diving Control Board, the Board shall advise the President, Director or Head of Department on the appointment of the Diving Officer. The Diving Officer has the responsibility to carry out the policies of the Diving Control Board and is a member of the Diving Control Board. The Diving Officer must have several years of research or scientific diving experience, and should be an in-date diver, with a thorough knowledge of diving theory, safety practices and operational procedures. This pattern of management is most common in the USA and Canada.
3.1.4. Chief Diver/Diving Officer’s Appointee [Level 4]
Institutes or universities that do not appoint a Diving Control Board, and do appoint a Diving Officer with scientific seniority, should also appoint a Chief Diver. The Chief Diver should be appointed by, and report to, the Diving Officer. The Diving Officer is responsible for choosing for this post a diver who can be trusted to act as the nucleus for a safe diving team. This system of management is used in British and some European institutes. The responsibilities of the Chief Diver overlap considerably with those of the Diving Officer in establishments with a Diving Board of Control; in subsequent sections of this Code the term Diving Officer/Chief Diver will frequently be used to describe personnel with these responsibilities.

For this post, a minimum formal qualification should be at least at the level of CMAS 3-Star or NAUI Level IV (Advanced Diver), with a minimum of 50 scientific dives. In a large institute the Diving Officer should ensure that the diver appointed has in addition the personal qualities and experience normally appropriate to a CMAS 4-Star diver and a wide experience of working underwater.

The Chief Diver has full responsibility for all matters connected with diving safety, including training and equipment. It is ultimately at the discretion of the Chief Diver that an individual engages in diving for an institute. The Chief Diver is broadly equivalent to the Diving Supervisor positions referred to in some commercial diving legislation. In a large institution several teams of divers may be operating at different locations, and the Chief Diver will delegate responsibility for diving safety in each group to a designated individual.

All members of a research establishment including the Diving Officer are expected to defer to the views of the Chief Diver on safety provisions.

3.1.5. Chief Scientist/Project Leader/Principal Investigator
In all scientific diving there shall be a person responsible for the scientific objectives and line management aspects of the project. This person is usually known as the Chief Scientist, Project Leader or Principal Investigator. For projects requiring diving support the Chief Scientist is often not a diver and should consult the Diving Officer at the earliest possible stage in project planning.

The Chief Scientist will defer to the views of the Chief Diver, Dive Marshal or Dive Leader on matters connected with safety. This must be regarded as a condition for the undertaking of any diving project.

3.1.6. Dive Marshal/Dive Supervisor/Dive Master/Person in Charge [Level 5]
A Dive Marshal or Supervisor will be appointed from among the divers by the Chief Diver, if he/she does not himself undertake the duty.

During the preparation and carrying out of any particular diving project for which he has been appointed, the Dive Marshal has the responsibilities of the Diving Supervisor, as defined in some commercial diving regulations.

Minimum qualification is at the equivalent level of CMAS 3-Star (NAUI Level IV, Advanced Diver) with some scientific diving experience, but the Chief Diver must additionally be satisfied that the diver appointed understands the work task and can carry out the duties safely and efficiently.

The Dive Marshal has full operational responsibility for a diving expedition working under
the scientific direction of the Chief Scientist. It shall be the responsibility of the Dive Marshal to ensure that the conditions and practices laid down by this Code are complied with on site.

It may happen that the Chief Scientist, if he/she has the appropriate diving experience, could be appointed as the Dive Marshal for a particular operation. However, in some establishments this is regarded in general as an undesirable practice, since it is considered that the Chief Scientist’s understandable wish to finish a task may overrule better judgement on safety. It is therefore recommended that the Dive Marshal and Chief Scientist should usually not be the same person.

3.1.7. Dive Leader [Level 6]
A Dive Leader will be appointed from among the divers by the Dive Marshal. The Dive Marshal may undertake the task of Dive Leader.

The Dive Leader has operational responsibility for a dive, and works under the orders of the Dive Marshal/Supervisor and under the scientific direction of the Chief Scientist.

3.1.8. Diver [Level 7]
Divers are expected to work under the instructions of the Dive Leader, but if they are not satisfied with any aspect of the project they should not be ordered to continue. Every diver has the responsibility to ensure that all personal logbooks are kept up to date, and the terms of any regulations complied with.

Ultimate responsibility for safety rests with the individual scientific diver. It is the diver’s responsibility and privilege to refuse to dive if, in his/her judgement, conditions are unfavorable or unsafe, or if he/she would violate the dictates of their training or the provisions of this Code. No scientific diver shall ever be coerced to dive or be penalized for not diving. It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever he/she feels that it is unsafe or unwise to continue, unless it compromises the safety of another diver. No research dive-team member may be permitted to dive for the duration of any known condition that may be likely to adversely affect their own safety and health or that of any other team member. Each scientific diver shall conduct a functional check of their diving equipment in the presence of the diving buddy or tender.

3.1.9. Trainee/Diver-in-training [Level 8]
A scientific diver may be defined as a trainee, or have trainee status, in three different circumstances:
1. During initial instruction the diver does not yet have a sufficient number of dives and has not completed the necessary lectures, tests and examinations. This is a diver-in-training.
2. After completion of the required training course, a scientific diver may still need to obtain experience of scientific methods, experimental techniques or methodology by gaining working experience with a more qualified scientific diver.
3. When new experimental methods are to be used in extreme or unusual environmental conditions, a scientific diver may have to adopt trainee status in order to gain experience working alongside personnel who already have experience of the conditions.

3.1.10. Temporary Diver (See also 2.9)
A Temporary Diving Permit at an institution may be issued to a visiting diver from another institution, or from abroad, or to unpaid volunteers participating in diving for only a few days.
Temporary staff must have appropriate diving qualification, either of a sports, scientific or commercial nature. The Chief Diver/Diving Officer will generally require Temporary Divers to undergo one or more supervised familiarization dives. Portions of the institute diving requirements may be waived at the discretion of the Chief Diver/Diving Officer. Waiver and indemnity forms may be required (Appendix 9).

3.1.11. Ship's Master
The Master of a research or other vessel which is acting as a mother ship from which diving is taking place shall be consulted adequately in the planning stage of a dive. This is particularly important when divers from one country are diving on a vessel supplied by another country because of the difficulties of language and differences in practices.

The Master's word is final with regard to all actions on or near the vessel. This applies to launch and recovery of boats and whether diving can take place. In particular, the Master may consider that diving is not permitted if the requirement to stand by or to manoeuvre the vessel for rescue purposes would endanger the vessel itself.

The Master is responsible for displaying signals and lights from the vessel indicating that diving is taking place.

3.2. Delegation of duties
Duties that have been allocated to an individual may be delegated with specific authority to allow the delegate to carry out the task, but responsibility remains with the delegator. If the need to transfer responsibility does arise, for example when the Diving Officer or Chief Diver is on vacation or on sabbatical, the appointment of a replacement officer must be approved by the appropriate higher authority.

On the dive site, where the Person-in-Charge or Lead Diver wishes to dive, the duties for on-site supervision can be delegated to another individual with suitable qualifications by procedures that are standardized within the institution's diving programme.

3.3. Diving with other groups (see also 1.3)
Where divers from two or more institutions are planning to dive together in a joint project, it is usually best for the Diving Officers to agree on using one of the existing manuals or codes of practice, which shall apply to all the divers. This is the simplest procedure, provided that the methods of diving are reasonably similar, and the divers are given time to read the necessary documents and adapt to their requirements.

If it is not possible, or necessary, to agree on one of the existing safety manuals, the Diving Officers or Chief Divers should find out which of their procedures are the same, similar or in need of modification to allow the two (or more) diving groups to work together. A standard operating code for the conduct of the work must be agreed on and clearly communicated to all the divers and boat personnel involved. It may not be necessary for the personnel of the two groups to actually dive together as the work can go on in parallel or alternating dives; but it is important that each group knows the procedures of the other group, and that these procedures be brought to a common system, if possible, while the groups are in logistical or project contact. At the very least, divers from either group must be able to carry out emergency rescues on members of the other groups without incompatibility of equipment or technique.
SECTION 4. TRAINING AND MEDICAL EXAMINATIONS

4.1. Introduction
This section deals with the factors requiring attention in the preparation of personnel for diving. These include medical certification, personnel selection, fitness, gender factors, theoretical and practical training logbooks and qualification records. Training varies from country to country, and even though some of the recommendations here might exceed the present standards used locally, it is recommended that this section should be adopted as the minimum standard.

4.2. Medical certificates
In most countries, no statutory obligation is placed on establishments to require specific medical examinations for scientific divers. In some countries self-regulation based on the peer system obligates establishments to a common standard. In other countries legislation has been passed that sets the frequency and type of diving medicals, as well as the duration of validity of medical certificates. Generally, legislation has taken the form of commercial diving regulations, which are inappropriate for scientific diving.

There is a considerable range in working conditions and fitness requirements for scientific divers. For example, the medical standard required of a student collecting snails at 10 m is obviously not the same as that required for a researcher working at 200 m in saturation for 3 weeks. The vast majority of scientific dives are done to a depth of 20 m or less using scuba and entail light work such as collecting and sampling. Scientific diving activity is often seasonal and sporadic. There is no rationale for subjecting shallow-water divers to as rigorous a medical evaluation as deep water and extreme exposure divers. In response to these variables, two medical standards have been established in this Code allowing for different circumstances and frequency of diving. A number of authoritative medical check-sheets for scientific diving have already been produced which meet the guidelines for this Code and a recommended check-sheet has been developed using these examples (Appendix 9).

4.2.1. Minimum requirements for medical certificates
In many countries divers, whether in the employment of institutions or working as students or volunteers, must have a medical examination at least at the start of employment and annually thereafter. This must be at least of a level equivalent to that set out in the Class II medical certificate (4.2.2.; Appendix 9). It is strongly recommended that this should be adopted as the basic medical requirement by all establishments working to this Code of Practice.

4.2.2. Levels of medical certification (Appendix 9)
(a) Class II. This is the general medical certificate recommended for scientific diving under this Code of Practice. It should be used to medically certify divers for all diving except that associated with the Class I certificate. The period of validity of the Class II medical certificate is 12 calendar months.

(b) Class I. This is a specialized medical certificate recommended for use in evaluating medical fitness for saturation or exceptional exposure decompression diving. The Class I certifi-
cate may be used in place of a Class II certificate to medically certify a diver. However, be-
cause of the added hazards of the radiological tests involved in having to otherwise take two
closely spaced radiological examinations, it is strongly discouraged as a general practice. The
period of validity of the Class I medical certificate is 6 calendar months. At the end of this
period, the Class I reverts to a Class II certificate for 6 calendar months.

4.2.3. Other certificates
There are a number of different commercial, military and sports diving medical standards used
nationally and internationally. When a new scientific diver joins an organization holding such
a medical certificate, the standard should be consulted to determine if it correlates as
equivalent to the Class I or Class II medical standard recommended by this Code. It is recom-
manded that equivalent medical certificates should be recognized, and repeat medical
examinations be avoided.

4.2.4. Decompression training and medical records
Divers must be thoroughly instructed in the dangers of decompression sickness, the use of no-
decompression limits and, when relevant, the conduct of decompression dives (4.11;11).
Recent research in decompression theory suggests that the tissue models used in computing ex-
isting air diving tables are not accurate. One implication of this research is that divers should
be conservative when using the tables. A second is that information ought to be collected on
the incidence of decompression sickness and aseptic bone necrosis among divers operating
with these tables, or with decompression computers, in order to validate empirically the tables
and document the risks their use entails.

It is strongly recommended that similar programmes be set up for divers operating with other
major tables in use (French tables, US Navy tables, Defence and Civil Institute of Environmen-
tal Medicine tables [Canada], etc.), and that examining physicians be made aware of this
service.

Medical Officers employed by an establishment to conduct the medical evaluation of divers
and to treat divers’ injuries should be apprised of the nature and treatment of decompression
sickness and bone necrosis. Incidents of decompression sickness should be fully documented
with medical records and dive record sheets (4.7). Post-treatment: the long-term effects of inci-
dents should be monitored, including any possible onset of aseptic bone necrosis.

4.2.5. Gender factors in diving
Women and men have some differing physiological parameters in diving, therefore their med-
cal certification requires slightly different emphasis. For example, a woman’s subcutaneous fat
deposits may tend to increase the risk of hyperthermia as well as of decompression sickness,
and diving during menstruation somewhat elevates susceptibility to decompression sickness, as
may the use of birth control pills. Conversely, it has been suggested (Edmonds et al., 1981)
that women are liable to hypothermia because of their lower body weight. These two conflict-
ing hypotheses illustrate the lack of clear evidence in this matter and the doubtful basis for
mandatory regulatory distinctions based upon gender.

Men with low subcutaneous fat levels are more susceptible to hypothermia, and facial hair
can interfere with the seal of a facemask. Strength of both men and women should be
evaluated on a task-specific basis and should be adequate for foreseen circumstances. En-
durance varies significantly among both individual men and women and can be markedly
influenced by fitness, training and skill. Culturally, there is evidence to suggest that men are more likely to be cavalier about diving safety, more apt to abuse alcohol or dive when fatigued or not up to standard physically. Here again there is marked variance among individuals.

Medical check-lists incorporate the more significant of these variables. It is advisable that the Medical Officer employed by the establishment to conduct the medical evaluation of divers should know of these differences and be able to advise divers in these matters. Additionally, the Chief Diver/Diving Officer should similarly know and be able to evaluate the fitness of individuals for diving activity.

4.2.6. Pregnancy and diving
Some countries may ban employed women divers from diving during pregnancy, while others make no such restrictions. Where there is legislation in these matters, it should be given priority. Where no such legislation exists, the following guidelines are applicable, and have been prepared by a group of women scientific divers (Unpublished report prepared for the British Natural Environment Research Council Safety Officer, 1984).

Normal standards of health and fitness required for diving must be upheld. Consequently, certain temporary medical problems, e.g. elevated blood pressure, toxaemia, severe nausea and sickness, varicose veins, vertigo, etc. arising during pregnancy, or as a result of menstrual or hormonal disturbance, however caused, should be regarded as probable contra-indications to diving depending on their severity. Symptoms must be assessed individually by a competent medical officer. Certification of fitness for diving should therefore normally be obtained if such problems arise and persist, particularly if medication is being taken.

There is some evidence that women are naturally slightly more susceptible to decompression problems (Edmonds, et al., 1981). It may be prudent therefore, in planning decompression schedules to allow a wider margin of safety than usual in interpreting maximum depth and times required in no-stop and stage decompression diving.

Particular attention should be focused on potential hazards associated with diving during pregnancy, in addition to other health problems identified. Any abnormality of pregnancy, e.g. Placenta praevia, blood loss, threatened miscarriage, etc. should be regarded as a disqualifier for diving.

Diving may possibly incur hazards both for the unborn child and for a pregnant woman herself, even when there is no existing health problem (Bolton, 1980; Edmonds et al., 1981; Rankin, et al., 1980). The evidence is not statistically clear either for or against this proposition and the woman diver must be encouraged to make her own decision within the limits of existing legislation or rules. Women divers should keep a careful check on their menstrual cycle so that pregnancy, if suspected, can be confirmed as early as possible. This is in their own and in their colleagues' interests. The most critical time for the foetus is possibly during the first trimester, when foetal development could be placed at risk (Bolton, 1980). For this reason, women planning conception may be wise to restrict diving in order to cover the period when pregnancy cannot be detected.

In late pregnancy (third trimester), mental alertness is often deleteriously affected so that responsibilities and decision-making, especially in emergencies, could be seriously diminished.

A woman's physical shape and condition in the third trimester are such that they render her more easily fatigued and less agile. These factors are likely to affect her safety and stamina in

SECTION 4. TRAINING AND MEDICAL EXAMINATIONS
diving, particularly in carrying heavy gear which she should not be doing at this time. In practice, individuals may vary from feeling quite fit throughout pregnancy to being totally incapacitated even for the mildest levels of physical work, especially in the third trimester.

Under normal circumstances therefore, a woman should not undertake diving duties during the third trimester as her condition may affect the safety of both herself and her colleagues.

In conclusion, if pregnancy is suspected or confirmed, diving should be restricted:

1. First trimester: Maximum depth of 20 m, and a duration of half the no-stop time (limit of no decompression stop diving) of the decompression tables (Section 11).
2. Second trimester: Maximum depth of 20 m, and a maximum duration 5 minutes less than the no-stop time.
3. Third trimester: No diving.

4.2.7. Confidentiality of medical reports
The detailed medical report of a doctor examining a diver should be treated as confidential, and the doctor should report to the employer whether the diver is or is not fit for diving. However, it is in the interests of safety that the Chief Diver/Diving Officer be informed that a diver is suffering from a particular condition, before the diver takes part in diving operations, if the medical officer considers that this might in any way limit the type of diving operations for which the diver is fit.

4.3. Fitness
In establishments where personnel dive regularly, the diving itself will keep them physically fit; special attention need only be paid to colds or other passing ailments. Where personnel dive only from time to time there will be a problem of maintaining adequate physical fitness. Although fitness may not apparently be needed to perform planned tasks, an emergency can produce a situation where fitness, quick reflexes and strength may make the difference between safety or a serious accident. In preparation for diving operations the senior diver in charge should consider the fitness of personnel involved, taking into account the recent diving operations or sporting activities which may have helped to maintain fitness. If personnel are obviously unfit they should be given a series of swimming and snorkeling exercises in the weeks preceding field work. Regular aquatic exercise contributes to diving safety. Divers should be able to complete an 800 m snorkel swim with fins in 16 minutes.

4.4. Swimming pool and sea training schedules
Recent surveys of establishments where scientific diving is carried out have shown that the diving techniques used are almost exclusively those of scuba. The minimum training standard
accepted by Diving Officers is generally that of a mid-level sport diving certification such as the NAUI Level IV, BSAC Advanced Diver and CMAS 3-star. However, it is recognized that a newly trained diver usually requires 10-30 working dives after completing certification before they can be considered fully trained for scientific work. Training schedules are established in codes published by the AAUS and CAUS.

Additionally, in some countries (Canada and the US) divers are allowed to enter diving programmes at a lower level of certification (NAUI Level II) as 'divers-in-training', and gain experience through on-the-job training for eventual certification as scientific divers (2.9). This method allows divers to be fully trained for task-specific skills in fewer dives and consequently to be certified in fewer dives.

Initial instruction of divers may be accomplished within the establishment or by sending them to a recognized club, dive store or diving school.

In the training of scientific divers it is important that the discipline of thinking and working while diving should be introduced early on. This should be done in parallel with the tests of ability to swim, cope with diving equipment and maintain safety, which are typical of sports diving training. This work training should be of an introductory or familiarization nature, and not so arduous that it interferes with learning to dive. Work familiarization should concentrate primarily on the following range of tasks:

1. Navigation, search and recovery, underwater rope-work, dive-site selection, scientific dive planning and team-work.

A secondary range of work familiarization could include:

2. Sample collecting methods, data gathering techniques, common biota behavior, installation of scientific apparatus, site location and relocation, small boat operations and knowledge of government and legal requirements when diving at work.

Dive training should be conducted both in the pool or sheltered waters and in open water. The intensity of training may be increased by simulating adverse conditions in protected water, such as low light or reduced visibility, or by training under actual open water conditions but in a highly supervised and controlled setting.

Before any open water operations involving new equipment or untried methods or techniques are used, the personnel involved should train with the equipment in a pool or under sheltered conditions. Similarly, proposed work in extreme conditions such as under ice, rough seas or fast currents (8.2) should be preceded by appropriate training and practice in such conditions.

There should be thorough training in the use of adjustable buoyancy systems where they are being used.

4.5. Theoretical knowledge
Standards of theoretical knowledge must be at least to sports diving certification levels for scuba training (NAUI Level IV, CMAS 3-Star), preferably supplemented by additional reading. Theoretical knowledge related to equipment maintenance, navigation, first-aid and other specialized activities should be dealt with by instruction, reading and demonstrations. A written examination should be held as part of the training. Examinations designed to suit these specific requirements have been developed by a number of institutions and should be circu-
lated internationally to the respective national scientific diving organizations and other interested bodies so that the levels may be compared, with a view to future standardization.

4.6. Qualification standards and working depths
The following standards relating experience to operational diving are strongly recommended:
1. No diver should be employed on a working dive, even as a trainee, until they have obtained a 'diver-in-training' certificate or equivalent. The first ten working dives should not be deeper than 20 m.
2. A 'diver-in-training' should not dive except when accompanied by a specifically authorized scientific diver.

4.7. Dive record sheets
Detailed dive records maintained by the Diving Officer provide the following:
1. Administrative records of time spent in training and work, for the purpose of assessing efficiency of effort, personnel and expenditure.
2. Record of training and experience of personnel.
3. Evidence in the case of an accident.
4. Basis for certification of training.
5. Evidence of safe diving for insurance purposes.
6. Medical evidence for collection of data on decompression tables.

Specimen dive record sheets are shown in Appendix 12.

4.8. Logbooks
Individual divers should keep a logbook as evidence of their experience and training and for reference in the case of accidents. The minimum record should consist of: dive-site, date, maximum depth reached by the diver, name of diver, name of diving companion, name of dive supervisor, decompression schedule used, repeat tables used if any, outline of work, and sufficient data on start and surfacing times, and time of leaving the bottom, such that the dive profile can be checked against the decompression procedures carried out. In addition, the true clock time of surfacing must be recorded so that surface intervals can be calculated before making the next dive.

It is highly recommended that the diver’s logbook also contain a photograph, medical endorsements annually and certificates of training. A number of standard logbooks are available and some styles are included in this Code (Appendix 12).

To avoid loss of information, it is recommended as a general practice where divers are operating in inclement conditions, that dive records be kept on-site in a 'wet-log,' preferably made of waterproof paper, and daily transferred to the permanent log.

4.9. In-date qualifications and work-up dives
Scientists often do not dive regularly, and a check must be maintained on their readiness for working diving. The following two systems have been used successfully, and may be combined as suggested below.

4.9.1. In-date readiness system
This system assumes that a diver who has dived within a set period is fit and ready for working diving. The practice is liable to abuse, and personnel may carry out token dives which do not really maintain training. It seems preferable to set a time limit of one month within which personnel retain readiness for working diving, and to state that the qualifying dive must itself be a working dive, or a practice dive to at least 20 m for 20 minutes with a simulated work task. Except in coastal institutes, most divers will probably lapse from in-date readiness, and work-up dives will be necessary before projects.

4.9.2. Work-up dives

If a diver lapses from in-date readiness it does not affect the diver’s basic qualification. The sequence of work-up dives required to give working preparedness depends on the depth of work and the time lapse since the last dive. An outline of a recommended schedule is given in Table 4-1.

<table>
<thead>
<tr>
<th>Time Lapse</th>
<th>Working Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 m</td>
</tr>
<tr>
<td>1 - 2 Months</td>
<td>10 min</td>
</tr>
<tr>
<td></td>
<td>20 min</td>
</tr>
<tr>
<td>2 - 12 Months</td>
<td>10 min</td>
</tr>
<tr>
<td></td>
<td>20 m</td>
</tr>
<tr>
<td></td>
<td>Working Depth</td>
</tr>
<tr>
<td>Over 12 Months</td>
<td>Pool Test#</td>
</tr>
<tr>
<td></td>
<td>10 min</td>
</tr>
<tr>
<td></td>
<td>20 min</td>
</tr>
<tr>
<td></td>
<td>Working Depth</td>
</tr>
<tr>
<td></td>
<td>2 x 20 min</td>
</tr>
<tr>
<td></td>
<td>Working Depth</td>
</tr>
</tbody>
</table>

* In some countries this requires complete re-certification.

* Open water in very sheltered conditions may be suitable for these tests in a warm climate.

Dives should be considered purely as training, but may involve light work which can be easily abandoned in the interests of safety. Dives should be at least 20 minutes in duration, unless excessive decompression time would be incurred. If an individual fails in the task or seems unhappy during work-up dives, the Chief Diver/Diving Officer should extend the work-up period or drop the diver from the team. The briefer work-up schedules may be included in the first day or so of the project if the divers are generally fit, but the longer schedules should be started well in advance of work to allow for unforeseen problems and to regain fitness. Work-up dives appear to increase decompression safety by lessening the risk of bends.

The importance of the 'in-date' concept and the necessity for work-up dives cannot be stressed too strongly. They are key factors contributing to the overall safety of diving operations carried out by an establishment, and Directors, Heads of Departments and Chief Scientists, should always be aware of the need for diving personnel to maintain their state of readiness and allow sufficient time and funds for them to do so.
4.10. Team compatibility
Where projects involve the use of specialized equipment, or work in extreme or potentially hazardous conditions, an important factor of safety is the degree of team-work. In these circumstances the known or recorded qualifications of team members are not in themselves a guarantee of safety; the divers should be trained together frequently until the required degree of cohesion and mutual trust is developed. If diving is to be carried out in pairs, the Chief Diver/Dive Supervisor may establish fixed pairing for the work as it becomes clear which divers work best together. If a more general degree of team unity is required, diving pairs may be switched around, but it becomes important to drop from the team any individual who turns out to be incompatible with more than one or two of the other divers. This requires a great deal of discretion on the part of the Diving Officer or Chief Diver.

4.11. Compression chamber dry dives
On the first occasion of extensive work planned below 30 m it is advisable that divers should be exposed to the proposed working depth in a compression chamber where this is possible. This enables the project organizer to assess the ability of the divers to perform complex tasks while suffering from narcosis. Furthermore, the decompression phase may reveal personnel who are exceptionally liable to bends. Where extensive deep diving is carried out supported by an on-site compression chamber, it is advisable that several members of the team should be fully trained in chamber operation at a recognized school, since if only one operator were trained, there would be a dangerous situation if that person suffered a bend (4.2.4; 11).

4.12. Recognition of other training qualifications
The CMAS has produced an international comparison of certificates and qualifications issued by sports diving certifying agencies, with equivalence of standards (Appendix 7). Using this system of comparison, the CMAS Scientific Committee has developed a scientific diver certification (Brevet) based on the sports diving certifying criteria in different countries at the 3-Star level. The application form can be copied from Appendix 10.

As well, in several countries (e.g. Canada, the USA, the UK, South Africa and the Federal Republic of Germany) organizations have been founded to establish and maintain national standards for scientific diving. A number of authoritative national standards are now available. Three of these (Canadian, British, American, 2.4) have been primarily consulted in developing the training criteria set down in this Code of Practice (Appendix 13).

Institutes are recommended to certify their divers to the standards of this Code of Practice as a minimum international standard and to qualify divers to a higher standard in specific skills where necessary because of national or regional diving practices. In countries where no national or regional training standards for scientific diving have been set, establishments may supplement the minimum requirements of this Code with higher standards based on sports diving training programmes or their recognized CMAS equivalents, or commercial standards in mixed gas diving.

Full recognition should be given to training qualifications of military and commercial diving schools. In view of the lack of accepted certificates of working experience, Diving Officers should inspect log books of personnel from other institutions or from abroad. Chief Divers/Diving Officers should bear in mind that a highly trained diver from a foreign country may have a totally different range of practical experience and skill from that required locally (1.2; 1.3; 2.7).
4.13. Mixed-gas training

Scientific work may require the use of mixed-gas breathing equipment (7) for specific work-related purposes, for example, to diminish inert gas narcosis, to give increased endurance, to minimize acoustic noise or to eliminate the visual or mechanical disturbance caused by exhausted bubbles. In view of the complexity of the equipment and the need for an exceptionally high standard of maintenance and adjustment of the sets, potential users should attend an appropriate and recognized training course.

Commercial diving schools, military training schools, and in some cases government agencies (e.g. the National Oceanic and Atmospheric Administration Diving Unit in the USA offers mixed gas training) are potential sources of mixed gas training courses for scientific diving programmes and should be consulted as a resource.

Before use of non-scuba breathing systems, a check should be made of government regulations and professional and industry standards covering use of oxygen and mixed-gas systems, closed-circuit and semi-closed circuit diving equipment and training for use of these systems and equipment in the country of the potential user. Constant training must be maintained when using mixed-gas equipment, and a program of continuing training should be developed based on these requirements and the recommendations of the training agency and the equipment manufacturer.

A number of authoritative standards for mixed-gas diving have been developed (Appendix 2).