



EH & S

Florida Atlantic University

DIVING AND BOATING SAFETY MANUAL

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This Florida Atlantic University “Diving and Boating Safety Manual” has been reviewed and is approved for implementation by the Florida Atlantic University Diving and Boating Safety Committee. This manual replaces and supersedes all earlier versions.

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MANUAL REVISIONS

Page No.	Date	Person Entering Change	Page No.	Date	Person Entering Change
Cover page to new FAU/EH&S logo.	October 2007	Ian Anderson	109 Updated contact info	June 2011	David Muncher
Added building and room numbers to address.	October 2007	Ian Anderson	171 Added Appendix K	August 2011	David Muncher
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SECTION 1.00 GENERAL POLICY

1.10 Scientific Diving Standards

Introduction

A Diving and Boating Safety Subcommittee (DBSS) was originally established on April 17, 1998 by the Provost of Florida Atlantic University. The Provost has replaced the DBSS, which formerly reported to the Research Safety Committee, with a stand-alone Diving and Boating Safety Committee (DBSC). The DBSC has been delegated the authority to promulgate and administer University policies and procedures with regard to all diving and boating operations conducted in conjunction with academic and research activities at Florida Atlantic University. This manual, together with the Charter of the FAU Diving and Boating Safety Committee, the AAUS Standards For Scientific Diving, and applicable regulations, shall constitute the FAU Diving and Boating Safety Program. The DBSC shall have no oversight responsibilities for recreational diving by FAU organizations (i.e. diving clubs, etc.), which are not part of the academic and/or research missions of the University.

In August 2003, the American Academy of Underwater Sciences (AAUS) developed a consensus manual entitled, *Standards For Scientific Diving*, which FAU has adopted and incorporated by reference into the FAU Diving and Boating Safety Manual. The AAUS Manual is a minimum set of requirements, and organizations are free to insert additional protective measures and information specific to operational requirements.

When using this manual it is important to realize that all AAUS requirements apply and that there may be additional FAU requirements or procedures. The FAU Diving and Boating Safety Manual is most effectively navigated on the web or in its Portable Document Format (pdf) where the document's hot links can be utilized. Questions about, or difficulties in using, this manual can be referred to the Diving Safety Officer or the Diving Safety Office in the Department of Environmental Health & Safety (561-297-3129 or ehs@fau.edu).

Throughout this manual the Diving and Boating Safety Committee is equivalent to a Diving Control Board and may be used interchangeably. Similarly, Diving and Boating Coordinator is used interchangeably with Diving Safety Officer and with reference to Section 15.0 Boating Safety, Boating Safety Officer.

Purpose

The purpose of this Manual and the Scientific Diving Standards and Boating Regulations contained therein, is to:

Ensure that all scientific diving under the jurisdiction of Florida Atlantic University is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and,

To set forth standards for training and certification that will allow a working reciprocity with other AAUS member organizations. Fulfillment of the purposes shall be consistent with the furtherance of research and safety. It is the responsibility of each FAU certified diver to read and follow these standards.

These standards set minimal requirements for the establishment of the American Academy of Underwater Sciences (AAUS) recognized scientific diving programs, the organization for the

conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity between AAUS organizational members that adhere to these minimum standards.

This manual was developed and written by FAU by compiling the policies and Standards set forth by AAUS and in the diving manuals of several university, private, and governmental scientific diving programs. These programs share a common heritage with the scientific diving program at the Scripps Institution of Oceanography (SIO). Adherence to the SIO standards has proven both feasible and effective in protecting the health and safety of scientific divers since 1954.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29CFR1910, Subpart T) under certain conditions that are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). AAUS is recognized by OSHA as the scientific diving standard setting organization.

AAUS has been recognized as the organization which sets scientific diving standards. This manual incorporates all AAUS standards and extends them based on local procedure and by assent of the Florida Atlantic University Diving and Boating Safety Committee.

Scientific Diving Definition

Scientific diving is defined (29CFR1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

Scientific Diving Exemption

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T):

- a) The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
- b) The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
- c) The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
- d) Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.
- e) In addition, the scientific diving program shall contain at least the following elements (29CFR1910.401):
 1. Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; including procedures for emergency care, recompression and evacuation, and the criteria for diver training and certification.

Diving control (safety) board, with the majority of its members being active scientific divers, which shall at a minimum have the authority to: approve and monitor diving projects, review and revise the diving safety manual, assure compliance with the manual, certify the depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

Review of Standards

As part of each organizational member's annual report, any recommendations for modifications of these standards shall be submitted to the AAUS for consideration.

1.20 Operational Control

Florida Atlantic University Auspices Defined

For the purposes of these standards the auspices of Florida Atlantic University (FAU) includes any scientific diving operation in which FAU is connected because of ownership of any equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of employees of FAU or employees of auxiliary organizations, where such employees are acting within the scope of their employment, and the operations of other persons who are engaged in scientific diving at FAU or are diving as members of an organization recognized by FAU as an AAUS organizational member.

Florida Atlantic University adheres to the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs. The administration of the FAU Diving Safety Program which includes all scientific diving resides with the FAU Diving and Boating Safety Committee (DBSC).

The regulations herein shall be observed at all locations where scientific diving is conducted.

Florida Atlantic University Diving and Boating Safety Manual

Florida Atlantic University has developed and maintains a scientific diving and boating safety manual that provides for the development and implementation of policies and procedures that enable FAU to meet requirements of local environments and conditions as well as to comply with the AAUS scientific diving standards. FAU's Diving and Boating Safety Manual shall include, but is not be limited to:

- a) Emergency evacuation and medical treatment procedures.
- b) Criteria for diver training and certification.
- c) Standards written or adopted by reference for each diving mode utilized which include the following:
 1. Safety procedures for the diving operation.
 2. Responsibilities of the dive team members.
 3. Equipment use and maintenance procedures.
 4. Emergency procedures.

- d) Regulations for the operation of FAU vessels and boats.

Diving and Boating Coordinator

The Diving and Boating Coordinator serves as a member of the Diving and Boating Safety Committee (DBSC). This person must be a fully qualified Diving Safety Officer (DSO) and Boating Safety Officer (BSO) and have a broad technical and scientific expertise in research related diving and vessel operation.

a) Qualifications:

1. Shall be appointed by the responsible administrative officer or designee, with the advice and counsel of the Diving and Boating Safety Committee.
2. Shall be trained as a scientific diver.
3. Shall be a full member as defined by AAUS.
4. Shall be an active underwater instructor from a nationally or internationally recognized certifying agency.
5. Shall possess the knowledge, skills, and abilities (i.e. training and experience) necessary to oversee the Florida Atlantic University Boating Safety Program including:
 - a. Knowledge of applicable Federal and State laws for the operation of vessels.
 - b. Knowledge of all FAU boating policies and regulations.
6. Must have a working diving knowledge of:
 - a. Scuba (open circuit).
 - b. Nitrox.
 - c. Diving physics and physiology.
 - d. Gas laws.
 - e. Recompression and treatment tables.
 - f. Recompression chamber operations.
 - g. Recognition of signs and symptoms and immediate management of diving maladies.
 - h. Air compressors.
 - i. Safety, rescue, diving accident management, and emergency procedures concerning diving operations
7. Recommended knowledge should include:

- a. Mixed gas.
 - b. Semi-enclosed and closed circuit rebreather.
 - c. Gas mixing and analysis.
 - d. Lock-out diving.
 - e. Certification as a CPR/First-Aid Instructor.
 - f. Certification as an Oxygen First Aid Instructor.
8. Have a minimum of 5 years diving experience.
 9. Must exhibit leadership qualities and be willing to assume full responsibility for all diving operations and diving personnel.
 10. Be capable of planning, logging and directing all diving operations.
 11. Be familiar with all FAU diving regulations concerning diving operations.
 12. Have a broad knowledge of diving equipment, the limitations of each type, and the ability to determine the safety of this equipment.

b) Duties and Responsibilities

1. The DBC is responsible, through the DBSC, to the University Provost (or designee), for the conduct of the scientific diving and boating safety program of Florida Atlantic University. The routine operational authority for these programs, including the conduct of training, authorizations and certification, approval of dive plans, maintenance of diving records, and ensuring compliance with this manual and all relevant regulations rests with the Diving and Boating Coordinator;
2. Serves as a voting member of the DBSC and as the University's Diving Safety Officer;
3. May permit portions of this program to be carried out by a qualified delegate, although the Diving and Boating Coordinator may not delegate responsibility for the safe conduct any aspect of the FAU scientific diving program;
4. Is guided in the performance of the required duties by the advice of the DBSC, but operational responsibility for the conduct of the local diving program will be retained by the Diving and Boating Coordinator;
5. Shall suspend diving operations considered the DSO considers to be unsafe, injurious to health, improperly supervised, or unwise;
6. Submit written annual reports of all diving operations to the Diving and Boating Safety Committee, Director of Environmental Health and Safety, and AAUS;

7. Shall conduct administrative oversight of Florida Atlantic University's Boating Safety Program;
8. Shall conduct investigations of boating accidents and submit a report in writing to Diving and Boating Safety Committee, and Director of Environmental Health and Safety.

Diving and Boating Safety Committee

The Diving and Boating Safety Committee (DBSC) has been delegated the authority to promulgate and administer University policies and procedures with regard to all diving and boating operations conducted in conjunction with academic and research activities at Florida Atlantic University.

The DBSC shall be equivalent to the Diving Control Board required by the Occupational Safety and Health Administration at 29 CFR 1910.401(2)(iv), which exempts scientific diving from the commercial diving regulations.

The Provost will make the initial appointments to the DBSC, including the committee Chair. The Chair shall not be a representative of EH&S. The appointment of all members shall be for an indefinite length of time; however, the membership must elect/re-elect a Chairperson every two years. Vacancies in the membership shall be filled by appointment by the Provost from among a list of qualified and willing members of the University Community presented to the provost by the DBSC.

- a) The Diving and Boating Safety Committee (DBSC) in acting as Florida Atlantic University's Diving Control Board (DCB) shall consist at least five (5) members, a majority of which must be active scientific divers, with at least one member representing Environmental Health and Safety (EH&S). Voting members shall include the Diving Safety Officer, the responsible administrative officer, or designee, and should include other representatives of the diving program such as qualified divers and members of the FAU boating community.
- b) Has autonomous and absolute authority over the scientific diving program's operation.
- c) Shall approve and monitor diving projects.
- d) Shall review and revise the Diving and Boating Safety Manual when deemed necessary.
- e) Shall assure compliance with the Diving and Boating Safety Manual.
- f) Shall certify the depths to which a diver has been trained.
- g) Shall take disciplinary action for unsafe practices.
- h) Shall assure adherence to the buddy system for scuba diving.
- i) Shall act as the official representative of Florida Atlantic University in matters concerning the scientific diving program.

- j) Shall act as a board of appeal to consider diver-related problems.
- k) Shall recommend the issue, reissue, or the revocation of diving certifications.
- l) Shall recommend changes in policy and amendments to AAUS and Florida Atlantic University's Diving and Boating Safety Manual as the need arises.
- m) Shall establish and/or approve training programs through which the applicants for certification can satisfy the requirements of Florida Atlantic University's diving safety manual.
- n) Shall suspend diving programs that are considered to be unsafe or unwise.
- o) Shall establish criteria for equipment selection and use.
- p) Shall recommend new equipment or techniques.
- q) Shall establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
- r) Shall ensure that the Florida Atlantic University air station(s) meet air quality standards as described in Section 3.60.
- s) Shall periodically review the Diving and Boating Coordinator's performance and program.
- t) Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of Florida Atlantic University's diving safety manual.

Instructional Personnel

- a) Qualifications - All personnel involved in diving instruction under the auspices of FAU shall be qualified for the type of instruction being given.
- b) Selection - Instructional personnel will be selected by the responsible administrative officer, or designee, who will solicit the advice of the DBSC in conducting preliminary screening of applicants for instructional positions.

Diving Supervisor

Certain divers, duly qualified, may be selected by the DSO as Diving Supervisors. While fulfilling these duties, the Diving Supervisor shall report directly to the DSO. All decisions regarding the safety of diving operations shall be made by the DSO and/or the Diving Supervisor, irrespective of the Diving Supervisor's immediate supervisor. A Diving Supervisor shall have the authority to suspend diving operations, if in their opinion, conditions are unsafe. Only under emergency conditions may the Diving Supervisor alter provisions set forth in this manual. In so doing, the Diving Supervisor must exercise prudence and have reasonable assurance that departure from this manual would enhance personnel safety.

- a) **Qualifications:**
1. Must have a working diving knowledge of:
 - a. Scuba (open circuit).
 - b. Nitrox.
 - c. Diving physics and physiology.
 - d. Gas laws.
 - e. Recompression and treatment tables.
 - f. Recompression chamber operations.
 - g. Recognition of signs and symptoms and immediate management of diving maladies.
 - h. Air compressors.
 - i. Safety, rescue, diving accident management, and emergency procedures concerning diving operations
 2. Recommended knowledge should include:
 - a. Mixed gas.
 - b. Semi-enclosed and closed circuit rebreather.
 - c. Gas mixing and analysis.
 - d. Lock-out diving.
 3. Have a minimum of 5 years diving experience.
 4. Must exhibit leadership qualities and be willing to assume full responsibility for all diving operations and diving personnel.
 5. Be capable of planning, logging and directing all diving operations.
 6. Be familiar with all FAU diving regulations concerning diving operations.
 7. Has a broad knowledge of diving equipment, the limitations of each type, and the ability to determine the safety of this equipment.

- b) Responsibilities shall include, but not be limited to the following:
1. Schedule, plan and direct diving operations as assigned.
 2. Approve dive plans and submit copies to the DSO.
 3. Brief Operations Director or Master of Vessel, whichever is appropriate, concerning dive plans and emergency procedures.
 4. Maintain a log of all diving activities within their department and submit a summary of diving activities and dive logs for each diver for each cruise or dive trip to the DSO.
 5. Supervise maintenance of diving equipment for their department.
 6. Maintain a record of all facilities, personnel and equipment within their department, with information as to capability and qualification.
 7. Recommend to the DSO changes which will increase the safety and efficiency of diving operations.
 8. Review divers' qualifications and recommend depth qualification levels to the DSO.
 9. May temporarily revoke or restrict diving certification of any diver for cause during a diving operation.
 10. Report immediately in writing to the DSO any accident or violation of this manual during a diving operation under the Diving Supervisor's supervision.
 11. Maintain competency in advanced levels of scuba diving, dive rescue, and dive accident management.

Lead Diver (Diver-in-Charge)

For each dive, one individual shall be designated as the Lead Diver who shall be at the dive location during the diving operation. The Lead Diver shall act as on-site supervisor, shall ensure that diving operations are conducted in a safe manner as described herein during that given operation. The Lead Diver may only supervise dives to depths that do not exceed their depth limitation.

a) Qualifications:

1. Must be an experienced diver and must be an active FAU certified diver in the Diving Safety Program, capable of planning and supervising a diving operation safely. A diver with a FAU Temporary Diver Permit may not be the Lead Diver without the expressed written approval of the FAU Diving Safety Officer and demonstration of proficient diving experience;

2. Must have knowledge of safety, rescue, diving accident management, and emergency procedures concerning diving operations;
 3. Must be familiar with all FAU diving regulations.
- b) Responsibilities and Duties:
1. Coordination with other known activities in the vicinity that are likely to interfere with diving operations.
 2. Ensuring all dive team members possess current certification and are qualified for the type of diving operation.
 3. Planning dives in accordance with Section 2.20 and all other FAU Standards within this Manual, and submission of FAU Dive Plan Form (Appendix E) to the DSO, with special consideration for repetitive dive status of each diver, decompression schedules, and emergency plans.
 4. Schedule and direct diving operations.
 5. Ensure that all divers have proper and required equipment.
 6. Ensuring safety and emergency equipment is in working order and at the dive site.
 7. Evaluate environmental conditions before diving.
 8. Briefing dive team members on:
 - a. Dive objectives.
 - b. Unusual hazards or environmental conditions likely to affect the safety of the diving operation.
 - c. Modifications to diving, emergency procedures or diver's signals necessitated by the specific diving operation.
 9. Suspending diving operations if in their opinion conditions are not safe.
 10. Reporting to the DSO or any physical problems or adverse physiological effects including accidents or symptoms of pressure-related injuries, during a diving operation under the Lead Diver's supervision.
 11. Brief Diving Supervisor, Operations Director or Master of Vessel, whichever is appropriate, concerning dive plans and emergency procedures.
 12. Ensure that proper action is taken during a diving emergency or accident.
 13. May temporarily revoke or restrict diving certification of any diver for cause during a diving operation under the Lead Diver's supervision.
 14. Report immediately in writing to the DSO any violation of this manual during a

diving operation under the Lead Diver's supervision.

Boating Supervisor

A Boating Supervisor is a Principal Investigator, Project Supervisor or Administrative Officer who is a faculty member, staff member, or administrator that has approved the project materials and methods for which boating is required.

Principal Investigators, Project Supervisors, and Administrative Officers are responsible for assuring that all boat operations that are part of a program under their direction are conducted in accordance with this manual.

Principal Investigators, Project Supervisors and Administrative Officers must determine that all individuals assigned to boat operations related to their projects are properly authorized and trained as described below.

If authorized by the Diving and Boating Coordinator, the Boating Supervisor may also conduct check-offs of Trainees to determine if they are competent to operate boats under the auspices of FAU.

Boat Operator

- a) Only FAU employees may operate FAU vessels or vessels. All others may apply for permission from the Diving and Boating Safety Committee by making application with the Diving and Boating Coordinator.
- b) In US waters non-FAU owner/operators must comply with USCG, state, and local regulations covering chartered vessels. In foreign waters, the responsible FAU person shall ensure the vessel meets the requirements of this manual.
- c) The designated Boat Operator is responsible for all aspects of boating operations, regardless of any senior personnel present in the boat. These responsibilities include, but are not limited to:
 1. Safety of the vessel and all persons on board.
 2. Operation of the vessel in compliance with federal, state, and local regulations and the FAU manual. Boat Operators are liable for all violations.
 3. Safe transport of the vessel to and from the launch site, if applicable.
 4. The safe operation of all equipment.
 5. Ensuring that all required operational and safety equipment is on board and that crew and passengers know the location and how to operate safety/survival equipment.
 6. Report all accidents, incidents, boardings, citations, safety concerns, and issues to the BSO.

- d) Boat Operators may supervise Trainees operating FAU boats for the purpose of accruing operating hours required to be checked off.
- e) Failure to comply with provisions of the Diving and Boating Safety Manual may be cause for the revocation or restriction of the operator's authorization. However, any operator may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation that is likely to cause death, serious physical harm, damage to the vessel, or major environmental damage.
- f) The Boat Operator or person in charge of the vessel is obligated by law to provide emergency assistance that can be safely provided to any individual in danger at sea. The operator or person in charge is subject to a fine and/or imprisonment for failure to do so.

Reciprocity and Visiting Scientific Diver

No visiting diver may dive on FAU projects, from FAU vessels or small boats, or use FAU dive equipment without prior approval by the FAU Diving Safety Officer. Reciprocity for scientific divers in good standing exists between FAU and other AAUS Organizational Members.

- a) Two or more AAUS Organizational Members engaged jointly in diving activities, or engaged jointly in the use of diving resources, shall designate one of the participating Diving Control Boards to govern the joint dive project.
- b) A Scientific Diver from one Organizational Member shall apply for permission to dive under the auspices of another Organizational Member by submitting to the Diving Safety Officer of the host Organizational Member a document containing all the information described in Appendix 6, signed by the Diving Safety Officer or Chairperson of the home Diving Control Board.
- c) A visiting Scientific Diver may be asked to demonstrate to the DSO, or designee, of the host organization their knowledge and skills for the planned dive and to submit additional forms.
- d) If a host Organizational Member denies a visiting Scientific Diver permission to dive, the host Diving Control Board shall notify the visiting Scientific Diver and their Diving Control Board with an explanation of all reasons for the denial.
- e) Visiting divers from non-AAUS organizations may apply to the FAU Diving and Boating Safety Committee through the FAU Diving Safety Officer for a FAU Temporary Diver Permit. Requirements and documents for this permit are described in Section 5.34 of this manual.

Waiver of Requirements

The Diving and Boating Safety Committee may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

1.25 Departmental Control and Responsibilities

University departments and programs may own and provide resources in support of scientific diving operations to FAU Scientific Divers. Such resources may include diving equipment, other diving supplies, boats or motor vehicles. Prior to release, each department or program, which provides resources in support of diving, shall have measures in place to ensure that:

- a) Departmental diving resources are serviced and maintained in compliance with pertinent sections of this manual and approved by the DBSC/DSO;
- b) Departmental diving resources are limited to use by personnel authorized by the DBSC/DSO.

Departmental control measures shall be implemented to the satisfaction of the DBSC. A periodic review of departmental control measures shall be made by the DSO. Results of the review shall be reported to the DBSC and Head of the department or program with recommendations regarding whether revisions in departmental procedures are needed.

1.30 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the requirements of this manual may be cause for the revocation or restriction of a diver's scientific diving authorization by the DBSC. The DBSC may direct the University to invoke additional sanctions (e.g. through withholding proposals, grants, or contracts) against the responsible parties if the situation warrants.

1.40 Consequences of Violation of Regulations by Organizational Members

Failure to comply with the regulations of this standard may be cause for the revocation or restriction of Florida Atlantic University's recognition by AAUS.

1.45 Violation Review and Disciplinary Process

The DBSC shall have the authority and obligation to require changes in any project or practice to comply with regulations or to meet reasonable standards of safety and health. In the event that any project or practice presents imminent danger to the health or safety of any individual, or presents a threat to the safety of property, the DBSC shall have the authority to immediately suspend the project or practice. In such cases, the DBSC must notify the:

- a) Chairperson of the Department involved;
- b) Dean of the College to which the Department belongs;
- c) Director of EH&S;
- d) Vice President for Research; and the
- e) Provost's office.

The DBSC will convene within 72 hours to make a recommendation as to how the situation shall be addressed before work will be permitted to resume.

In cases of non-compliance with established policies, procedures, regulations, or safety rules where there is no imminent danger to individuals or property, the DBSC will notify the user to correct the violation. In instances where the user refuses or neglects to correct the violation, a three stage enforcement process will be followed:

Stage 1: The DBSC will notify the Principal Investigator (PI) in charge of the project in writing, describing the violation and personnel involved. A suggestion as to how compliance with University procedures can be achieved will be included, and the PI will be asked to notify the DBSC within 5 working days of the status of his efforts to make the correction. The DBSC will schedule a follow-up inspection to verify corrective actions have been completed.

Stage 2: If the DBSC is not able to achieve compliance through efforts outlined in Stage 1, the status of the situation will be brought to the attention of the PI's Department Chairperson with a copy to the Dean of the College to which the Department belongs. The Department Chairperson will be asked to assist the DBSC in correcting the violation(s).

Stage 3: If for any reason the second stage action does not result in compliance, the Dean of the College to which the Department belongs will be asked to assist the DBSC in correcting the violation(s). The Dean will review the situation to determine the seriousness of the identified violation(s) and the actions of the PI. The PI will be asked to meet directly with the Dean and the DBSC Chairperson to outline why he/she is unable to comply. The Dean and the DBSC Chairperson will take actions which they deem appropriate to meet compliance, which may include suspension of the PI's approval to conduct diving/boating operations on a temporary or permanent basis.

Appeals: Individuals may appeal the actions of the DBSC by filing a written request for a review of the actions with the Chairperson of the DBSC. The DBSC Chairperson will convene a review panel within one week. The review panel will be comprised of a sufficiently diverse number of individuals so as to provide impartiality. Review panel members will be drawn from the DBSC, University Administrators, Faculty, Students, Experts in the Field, etc.

The Appellant will present their case to the review panel, and the review panel will either affirm the original decision or issue a different recommendation to the DBSC. If the review panel recommends a different course of action, the DBSC will meet to discuss the matter and issue a final ruling, which may incorporate some, all or none of the review panel's recommendations.

1.50 Record Maintenance

The Diving Safety Officer or designee shall maintain permanent records for all authorized Scientific Divers. The file shall include evidence of certification level, log sheets, waiver, results of current physical examination, reports of disciplinary actions by the FAU Diving and Boating Safety Committee, and other pertinent information deemed necessary.

Availability of Records:

- a) Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.
- b) All non-confidential records shall be available to employees, former employees, or authorized representative upon request to the FAU DBSC/DSO. Confidential records (i.e.

medical records) will not be released without written permission of the affected individual.

- c) Records and documents required by this standard shall be retained by Florida Atlantic University for the following minimum periods:
1. Physician's written reports and statements of medical examinations for FAU dive team members: 5 years.
 2. Diving and Boating Safety Manual, the current and all previous versions.
 3. Records of dive – one year for paper copies, 5 years where there has been an incident of pressure-related injury. Digitally stored database records will be kept indefinitely.
 4. Pressure-related injury assessment: five years.
 5. Records of hospitalization: five years.
 6. Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.
 7. All other documents, indefinitely or at the discretion of the DSO.

SECTION 2.00 DIVING REGULATIONS

2.10 Introduction

No person shall engage in scientific diving operations under the auspices of Florida Atlantic University's scientific diving program unless they hold a current certification issued pursuant to the provisions of this standard.

2.20 Pre-Dive Procedures

Dive Plans

Before conducting any diving operations under the auspices of the University, the Lead Diver for a proposed operation shall formulate a dive plan, and submit it to the DSO for review at least five business days before the scheduled diving operation(s). No dive(s) shall be conducted under the auspices of FAU without an approved dive plan, signed by the DSO.

The DSO shall review and approve or disapprove the dive plan in a timely fashion. For complicated operations or those occurring outside the United States, the DSO may request the approval of the DBSC. In such cases, additional time for approval may be required. Approval must be obtained prior to commencement of diving operations (see FAU Appendix E, Dive Plan Form). Dive Plan Forms are also available on the EH&S website (www.fau.edu/ehs) under the "Diving and Boating Safety Program" link.

Before conducting any diving operations under the auspices of Florida Atlantic University, the Lead Diver for a proposed operation must formulate a dive plan (Appendix E) that should include the following:

- a) Divers qualifications and the type of certificate or certification held by each diver.
- b) Emergency plan (see Appendix 7) with the following information:
 1. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
 2. Nearest operational decompression chamber.
 3. Nearest accessible hospital.
 4. Available means of transport.
- c) Approximate number of proposed dives.
- d) Location(s) of proposed dives.
- e) Estimated depth(s) and bottom time(s) anticipated.
- f) Decompression status and repetitive dive plans, if required.
- g) Proposed work, equipment, and boats to be employed.
- h) Any hazardous conditions anticipated.

Pre-dive Procedures

- a) Prior to the dive the Lead Diver shall brief the divers regarding the following:
 - 1. Review dive tables/computers used.
 - 2. Review allowable no-decompression bottom times for a planned depth and next greater depth for each diver.
 - 3. Unusual hazards.
 - 4. Emergency procedures, including location of nearest phone or radio, emergency plan, and first aid/oxygen kit
 - 5. Diver's signals.
 - 6. Dive objectives.

- b) Diver's Responsibility:
 - 1. Diver's shall insure their equipment is in proper working order prior to each dive and that the equipment is suitable for the type of diving operation planned. Equipment failures shall be reported to the Diving Supervisor or Lead Diver. Scientific divers shall conduct a functional check of their diving equipment in the presence of the diving buddy or tender.
 - 2. It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unfavorable, or if they would be violating the precepts of his/her training, of this standard, or regulations of this manual.
 - 3. No dive team member shall be required to be exposed to hyperbaric conditions against their will, except when necessary to prevent or treat a pressure-related injury.
 - 4. Each diver shall maintain good physical condition and shall not be permitted to dive for the duration of any known condition, which is likely to adversely affect the safety and health of the diver or other dive members. Nor shall divers or their partner dive under the influence of medicines, drugs, alcohol or other substances which may hamper a diver's coordination or good judgment.
 - 5. No diver shall exceed his/her depth limit certification except as outlined in Section 5.40 of this manual or by prior approval of the DSO.

- c) Equipment Evaluations
 - 1. All diving and safety equipment shall meet the requirements and specifications given in Section 3.00.
 - 2. Divers shall ensure that their equipment is in proper working order and that the equipment is suitable for the type of diving operation.

3. Each diver shall have the capability of achieving and maintaining positive buoyancy.
- d) Site Evaluation - Environmental conditions at the site will be evaluated.
- e) Any changes to an approved dive plan (including date, location, personnel) must be approved by the DSO prior to the dive.

2.30 Diving Rules and Procedures

Solo Diving Prohibition

All diving activities shall assure adherence to the buddy system for scuba diving. This buddy system is based upon mutual assistance, especially in the case of an emergency. Solo diving with scuba shall be allowed in the case of emergency or if tethered and with the expressed consent of the DSO.

Refusal to Dive

- a) The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever they feel it is unsafe for them to make the dive.
- b) Safety - The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in their judgment, conditions are unsafe or unfavorable, or if they would be violating the precepts of their training or the regulations in this standard.

Termination of the Dive

- a) It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever they feel it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.
- b) The dive shall be terminated while there is still sufficient cylinder pressure to permit the diver to safely reach the surface, including decompression time, or to safely reach an additional air source at the decompression station.

Emergencies and Deviations from Regulations

Any diver may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation that is likely to cause death, serious physical harm, or major environmental damage. A post-dive written report of such actions must be submitted to the Diving and Boating Safety Committee explaining the circumstances and justifications.

Separation and Missing Diver Protocol

- a) Diver separation- In the event that the divers become separated (on descent or on the bottom), they shall try to reestablish contact for 1-2 minutes, then surface to re-establish contact, and review dive tables/computers for repetitive dive.
- b) Missing divers- The dive team (and/or boat operator) should immediately recover any remaining divers and begin search, starting at the point of the dive site and working down current considering rate of drift. If possible, a float should mark the dive site and another

float with drogue set to drift to indicate possible direction and speed of missing diver. The dive team should immediately establish contact with the Coast Guard (Channel 16 in most US locations). Then the dive team (boat operator, or Coast Guard) should make the following general call to all vessels on Ch 16 and on other commonly used radio channels (e.g., Ch 20, 68): “PAN, PAN...all vessels please be on the lookout for missing divers, state name and description of your vessel, location, depth, how many divers, and time they should have surfaced.”

No-Decompression Diving

All dives shall be within the “No-Decompression” limits of the approved dive tables and/or dive computers unless approved by the DSO. All approved decompression diving will be conducted in accordance with Section 9.00.

Dive Tables/Computers

All dive tables, dive computers, and dive software must be approved by the FAU DBSC.

- a) Dive Tables- A copy of approved dive tables must be at the dive location in all cases, even when using the dive computers. All tables used must be at least as conservative as the US Navy Tables.
- b) Dive Computers-Divers who wish to use dive computers must receive training and be certified by the FAU DSO in the use of dive computers. Each diver must exhibit to the DSO’s satisfaction competency and a complete understanding of the computer they will use. All computer use must be in accordance with AAUS standards in Appendix 8. The DBSC reserves the right to refuse the use of any make or model of dive computer.
- c) Dive software must be approved before use by the DBSC on a case by case basis.

Safety Equipment

Safety Equipment appropriate for the planned dive must be available including:

- a) Diver’s first-aid kit.
- b) Emergency oxygen resuscitator.
- c) Dive Flags- Appropriate diving signals or flags shall be prominently displayed for all types of diving including snorkeling in accord with Section 3.40.

Standby Diver

The presence of a standby diver with no decompression loading (i.e., no residual nitrogen), fully ready to enter the water, is recommended in all diving circumstances and may be required by the DSO, Diving Supervisor, or Lead Diver, especially in operations with higher than normal risks such as diving in currents, in extremely limited visibility, or in deep water.

Limited Visibility

Under limited visibility conditions, divers shall wear a compass and be instructed in its use as well as use a close Buddy System and a tether, in that order, as conditions become worse.

Surface Monitoring

When more than four divers are in the water at once, the Lead Diver may appoint one person who is not diving to monitor the dive. The appointed person shall monitor entry and exit times of all divers, so as to insure that all divers and dive parties are accounted for.

Deep diving (greater than 100 feet)

- a) A weighted down line shall be secured to the support vessel unless drift diving with a surface float.
- b) Divers shall plan sufficient gas supply to allow for an emergency decompression stop.

Diving from Vessels

- a) The support vessel shall be equipped with a VHF radio, first-aid kit, and oxygen resuscitator.
- b) When diving from an anchored vessel, the divers shall ascend and descend on a down-line separate from any heavy anchor chain which may cause injury.
- c) When diving in current, if the vessel is at anchor, a tag line with a float shall be streamed approximately 100' behind the vessel.
- d) When diving from a mother vessel, a small support vessel shall be readied for immediate launch, or preferably in the water to retrieve fatigued or incapacitated divers.
- e) A boat operator shall remain aboard the support vessel during the dive unless this requirement is waived by the DSO or Diving Supervisor under certain circumstances, such as shallow dives in calm conditions or use of permanently moored buoys.
- f) If more than four dives are in the water safety procedures outlined for Surface Monitoring above should be employed.
- g) Divers must carry a whistle, inflatable safety marker/float. For offshore diving, an air horn and safety flares are recommended.
- h) Prior to the dive, the dive team must record the coordinates or location of the dive site, time of start of dive, and planned time for end of dive. This log shall remain on board with the boat operator.

Drift diving

Each team member must carry a surface float during a drift dive. Surface floats must be large enough to stay on the surface if moored on the bottom, must have sufficient line and strength for depth and current conditions, line should have reel for easy deployment and recovery, and bitter end should be securely attached to a hook for securing to the bottom. If multiple buddy teams are using one float, all divers must stay within close proximity to the float line, and a minimum of two divers must ascend together.

Night diving

- a) Divers shall carry a whistle and marker light (strobe or chemical stick) attached to their dive gear.
- b) Divers shall carry a dive light and each buddy team shall carry a backup light.
- c) A weighted down line with a light or strobe should be secured to the support vessel.

Safety Stops

Safety stops of 3 to 5 minutes at 15 (10-20) feet are required for any dives over 60 feet and for any repetitive dive. A safety stop of 5 minutes at 15 feet is required for multi-level dives (using either dive tables or computers).

Ascent Rates

Ascent rates should not exceed 60 feet/minute regardless of depth. During the last 60 feet ascent rates shall not exceed 30 feet/minute.

2.40 Post-Dive Procedures

Post-Dive Safety Checks

- a) After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions.
- b) When diving outside the no-decompression limits, the divers should remain awake for at least 1 hour after diving, and in the company of a dive team member who is prepared to transport them to a decompression chamber if necessary.
- c) All dives shall be logged by each diver on the FAU Dive Log Sheet (Appendix F) and be submitted to the DSO as soon as practical after the dive.
- d) Divers shall secure and be responsible for all gear following each dive.

2.50 Emergency Procedures

A diving accident victim could be any person who has been breathing air underwater regardless of depth. It is essential that emergency procedures are pre-planned and that treatment is initiated as soon as possible. Florida Atlantic University has developed emergency procedures which follow the standards of care of the community and includes procedures for emergency care, recompression and evacuation for each dive location (Appendix 7, Hospitals and Recompression Chamber Phone Numbers, and Appendix 7, the Diving Emergency Accident Manual).

Preparedness

- a) All diving personnel must be prepared to respond properly in the event of a diving accident.
- b) Periodic retraining and routine practice are essential elements in emergency preparedness; emergency drills are encouraged.

On-Site Accident Management Procedures

- a) The Lead Diver or Diving Supervisor shall take charge at the scene of the accident and delegate tasks to other responsible individuals.
- b) Stabilize life-sustaining functions and follow Accident Management Flow Chart (Appendix 7, p. 129).
- c) Establish radio communications through the Master of Vessel with predetermined medical facility (Appendix 7).
- d) Transmit the following information to the physician:
 1. Accident Call-In Data (Appendix E, p.124)
 2. Neurological Exam Checklist (Appendix 7, p.149)
 3. Checklist for Secondary Assessment of Injury (Appendix 7, p.151).
- e) All diving equipment of accident victim must be kept intact and tagged for later inspection and analysis.

Emergency Evacuation

- a) Have Master of Vessel contact U.S. Coast Guard (radio HF-2182, VHF-channel 16) or other appropriate authorities (Appendix 7, p.132).
- b) Follow medical evacuation procedures (Appendix 7, p. 128).
- c) Follow helicopter evacuation procedures, as necessary (Appendix 7, p.132).

Notification of Authorities

- a) After any serious diving accident or incident, the following personnel must be notified immediately, or as soon as possible: Diving Safety Officer, Chairman-Diving and Boating Safety Committee.
- b) After any diving incident resulting in injuries or symptoms, a written report (Accident/Incident Form Section 7, pg. 152) shall be submitted within one week by the Lead Diver to the DSO.
- c) After any diving accident or injury, requiring recompression treatment or resulting in moderate or serious injury, or death, a written report shall be submitted within one week by the DSO to the Chairman, Diving and Boating Safety Committee, and the Director, Environmental Health and Safety with the following information:
 1. Complete AAUS Accident Report (Accident/Incident Form Section 7, pg. 152).
 2. Name, address, phone number of the principal parties.
 3. Summary of experience of divers involved.

4. Location, description of dive site and conditions that led up to the incident.
 5. Description of symptoms, including depth and time of onset.
 6. Description and results of treatment.
 7. Disposition of the case.
 8. Recommendations to avoid repetition of incident.
- d) The FAU DBSC shall investigate and document any incident of pressure-related injury and prepare a report which is to be forwarded to AAUS during the annual reporting cycle. This report must be reviewed and released by the FAU Diving and Boating Safety Committee.

2.60 Flying After Diving or Ascending to Altitude (>1000 feet)

All divers are cautioned against flying or ascending to altitude immediately after diving. The resultant decrease in pressure may bring on decompression sickness. Divers should wait a minimum of a 12 hour surface interval before ascending to altitude and must not violate the “rules for flying after diving” according to the dive table or dive computer that he/she used for the dive.

The following surface intervals between diving OR ascending to altitude are required:

- a) No-decompression dive – 12 hours minimum, greater if required by dive table or dive computer used.
- b) Repetitive or Multi-day diving – 24 hours, minimum.
- c) Decompression dive - 24 hours minimum, 48 hours recommended.
- d) Mixed-gas or saturation dive - Consult hyperbaric physician.
- e) After recompression chamber treatment – Consult hyperbaric physician.

Before ascending to Altitude (>1000 feet) by Land Transport: Divers should follow the appropriate guideline for preflight surface intervals unless the decompression procedure used has accounted for the increase in elevation.

2.70 Record Keeping Requirements

Recording

- a) The DSO and Diving Supervisors shall maintain records of all dive logs, compressor air analyses, scuba equipment testing and inspections, and recompression chamber logs.
- b) The DSO shall record the occurrence of any diving-related injury or illness which requires any diver to be hospitalized or after an episode of unconsciousness related to diving activity, or after treatment in a recompression chamber resulting from diving.

- c) The DSO shall maintain records for each diver including evidence of certification, dive history, current FAU certification and depth limitations, dive logs, results of most recent diving physical examination, reports of any diving related injury or illness, reports of disciplinary actions related to diving, and reports of non-adherence to FAU diving standards.
- d) Minutes from meetings of the Diving and Boating Safety Committee shall be maintained by the DSO and distributed to Diving and Boating Safety Committee, and the Director, Environmental Health and Safety.
- e) Annual dive summary reports shall be compiled by the Diving Supervisors and DSO.
- f) Annual dive summary reports and dive accident reports of serious nature shall be submitted to the Diving and Boating Safety Committee, and AAUS by the DSO.

Personal Diving Log

Authorized scientific divers shall log every dive made under the auspices of Florida Atlantic University's and are encouraged to log all other dives. Standardized dive log forms are required by Florida Atlantic University and may found in Appendix F and on the FAU/EHS website at <http://www.fau.edu/facilities/ehs/safety/diving-boating-safety-forms.php> .

Log sheets must be submitted to the Diving Safety Officer on at least a monthly basis and in no case more than 30 days after completion of a dive under University auspices. Alternatively, and within the same deadlines, divers may submit their dive logs using the on-line form on the EH&S web site (www.fau.edu/ehs). The DSO will keep the log sheets as part of each diver's permanent file. Personal dive logs must include:

- a) Name of diver, buddy, and Lead Diver.
- b) Date, time, and location.
- c) Diving modes used.
- d) General nature of diving activities.
- e) Approximate surface and underwater conditions.
- f) Maximum depths, bottom time, and surface interval time.
- g) Diving tables or computers used.
- h) Detailed report of any near or actual incidents.

Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the FAU Diving and Boating Safety Committee and the AAUS. Florida Atlantic University's regular procedures for incident reporting, including those required by the AAUS, shall be followed. The report will specify the circumstances of the incident and the extent of any injuries or illnesses.

Additional information must meet the following reporting requirements:

- a) Florida Atlantic University shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.
- b) If pressure-related injuries are suspected, or if symptoms are evident, the following additional information shall be recorded and retained by Florida Atlantic University, with the record of the dive, for a period of 5 years:
 1. Completed AAUS Accident/Incident Report (Accident/Incident Form Section 7, pg. 152).
 2. Written descriptive report to include:
 - Name, address, phone numbers of the principal parties involved
 - Summary of experience of divers involved
 - Location, description of dive site, and description of conditions that led up to incident
 - Description of symptoms, including depth and time of onset
 - Description and results of treatment
 - Disposition of case
 - Recommendations to avoid repetition of incident
- c) Florida Atlantic University will investigate and document any incident of pressure-related injury and prepare a report that is to be forwarded to AAUS during the annual reporting cycle. This report must first be reviewed and released by the FAU Diving and Boating Safety Committee.

SECTION 3.00 DIVING EQUIPMENT

3.10 General Policy

All equipment shall meet standards as determined by the Diving Safety Officer and the Diving and Boating Safety Committee. All equipment shall be regularly examined by the person using them, and serviced according to manufacturer recommendations. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

3.20 Equipment

All diving equipment used on FAU projects shall be approved by the Diving Safety Officer.

All equipment shall be regularly examined by the person using them.

Backpacks

Backpacks without integrated flotation devices and weight systems shall have a quick release device designed to permit jettisoning with a single motion from either hand. These devices shall be functionally inspected and tested at intervals not to exceed 12 months.

Bail-out Bottles

Small bail-out bottles shall bear a current hydrostatic test date and shall be visually inspected once a year by certified personnel. Results of these tests shall be entered in the "Dive Equipment Service and Maintenance Log." Any bail-out bottle which fails a hydrostatic test shall be taken out of service and a hole drilled in the bottle to prevent its further use as a pressure vessel. Bail-out bottles shall meet the same criteria as compressed air scuba tanks.

Breathing Masks and Helmets

Breathing masks and helmets, if used shall have:

- a) A non-return valve at the attachment point between helmet or mask and hose, which shall close readily and positively.
- b) An exhaust valve.
- c) A minimum ventilation rate capable of maintaining divers at the depths to which they are diving.

Compass

All FAU divers are encouraged to have a compass available on all dives. A compass is required on all dives where low visibility conditions may be encountered.

Determination of Decompression Status: Dive Tables, Dive Computers, Dive Software

- a) A set of diving tables, approved by the Diving and Boating Safety Committee, must be available at the dive location. Dive tables shall be at least as conservative as the US Navy Tables.
- b) Dive computers may be utilized in place of diving tables, and must be approved by the Diving and Boating Safety Committee. AAUS Dive Computer Guidelines (Appendix 8) must be followed when using a dive computer.

- c) Dive and decompression software must be reviewed and approved by the DBSC.

Flotation Devices

- a) Each diver shall have the capability of achieving and maintaining positive buoyancy.
- b) A buoyancy control device (BCD) is required for ascent control and for emergency floatation.
- c) Personal flotation systems, buoyancy compensators, dry suits, or other variable volume buoyancy compensation devices shall be equipped with an exhaust valve, a manually activated inflation source (low pressure inflator hose, or gas cylinder), and oral inflation device.
- d) These devices shall be functionally inspected and tested at intervals not to exceed 12 months by a certified technician.

Gauges

Gauges shall be inspected and tested before first use and every 12 months thereafter.

Harnesses

The diver's harness shall be constructed of heavy-duty nylon webbing with "D" rings of sufficient strength to hold a diver's weight out of the water. The harness shall not be equipped with a quick release mechanism but shall be fastened with double "D" rings.

Inflatable Emergency Marker Tube

Each diver must be equipped with an emergency floatation/signaling tube with a minimum length of 48". It is recommended that a 15-20' lanyard be attached for use during safety decompression stops.

Knife

Each diver shall have some form of knife or cutting shears capable of cutting common minor entanglement obstacles.

Regulators

- a) Only those makes and models specifically approved by the Diving Safety Officer and the Diving and Boating Safety Committee shall be used.
- b) Scuba regulators shall be inspected and tested prior to first use and every 12 months thereafter.
- c) Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or redundant air supply) and a means to measure available breathing mixture pressure.
- d) Any work done to regulators shall be done by certified personnel and a record submitted to the DSO or entered into the "Dive Equipment Service and Maintenance Log."

Scuba Cylinders and Air Storage Tanks

- a) Scuba cylinders shall be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.

- b) All scuba cylinders shall be stamped with a current hydrostatic test date in accordance with DOT standards. Any scuba cylinder which fails a hydrostatic test shall be taken out of service and a hole shall be drilled in the tank to prevent its further use as a pressure vessel.
- c) All scuba cylinders must have an internal and external inspection visual inspection by certified personnel at intervals not to exceed 12 months.
- d) Results of these tests and inspections shall be submitted to the DSO or entered in the "Dive Equipment Service and Maintenance Log."
- e) All personal owned scuba cylinders used on a FAU project shall meet the above criteria.

Snorkel

Divers shall have a surface snorkel unless prior approval for omission by the DSO has been obtained. Certain types of diving such as wreck penetration or cave diving may make snorkel use impractical.

Surface Supplied Equipment

- a) Diving helmets and Submersible breathing masks - Service and maintenance of FAU approved helmets and masks shall be done by qualified personnel and work done shall be entered in the "Dive Equipment Service and Maintenance Log." Breathing masks and helmets shall have:
 - 1. A non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.
 - 2. An exhaust valve.
 - 3. A minimum ventilation rate capable of maintaining the diver at the depth to which he/she is diving.

Timing Devices, Depth, and Pressure Gauges

Both members of the buddy team must have an underwater timing device, an approved depth indicator, and a submersible pressure gauge indicating scuba tank pressure.

Umbilicals

All diving umbilicals shall be pressure tested to 1.5 times the normal working pressure and shall have a rated burst pressure of 4 times maximum working pressure. This pressure test shall be done at least once a year and results shall be noted in the "Dive Equipment Service and Maintenance Log." Any umbilicals which fail this test shall not be repaired and shall be removed from service. Umbilicals used for surface supplied operations shall be marked at 10 foot intervals with contrasting color tape. Ends of umbilicals shall be plugged when not in use.

Weight Belts

Weight belts must have a quick release device.

Whistle

Each diver must have a safety whistle or other noise generating signaling device.

3.30 Auxiliary Equipment

Hand held underwater power tools. Electrical tools and equipment used underwater shall be specifically approved for this purpose. Electrical tools and equipment supplied with power from the surface shall be de-energized before being placed into or retrieved from the water. Hand held power tools shall not be supplied with power from the dive location until requested by the diver.

3.40 Support and Safety Equipment

First aid supplies

A first aid kit and emergency oxygen shall be available at the dive location.

Emergency First-Aid Oxygen

An emergency oxygen resuscitation kit must be present and in good working order on all dive locations.

Diver's Flag

A divers-down flag (red background with white diagonal stripe) shall be displayed prominently whenever diving is conducted under circumstances where a flag is required, or where traffic is probable, including dives conducted from shoreline access. In Florida, the minimum size for any divers-down flag displayed on a buoy or float towed by divers is 12 inches by 12 inches. The minimum size for any divers-down flag displayed from a vessel or structure is 20 inches by 24 inches. All divers-down flags require a stiffener to keep the flag unfurled.

When diving from a vessel, the International Code flag Alpha (blue and white) shall be displayed when the vessel operator determines that it is required for compliance with the current U.S. Coast Guard rules published in "Navigation Rules, International and Inland" (e.g. if the vessel is restricted in its ability to maneuver).

University divers shall comply with all site-specific local, state, federal, and international regulations regarding marking of diving activities.

Compressor Systems

All compressors used to pump or transfer gas for breathing purposes shall meet the following criteria:

- a) Air intake shall be provided with a filter and shall be located in such a position to insure a supply of clean air, free from contamination by fumes, engine exhaust smoke, etc.
- b) Compressed air or gas must pass through high purity filters before being stored in pressure cylinders in order to remove dust, oil droplets, water, carbon monoxide and other contaminants (see Breathing Gas Standards, Section 3.60). Filters must be changed in accordance with filter and compressor service manuals and accomplishment of such recorded in the "Compressor Log Book."
- c) Oil lubricated compressors shall be well ventilated and otherwise cooled during operation to insure against high temperatures at which carbon monoxide may be formed.
- d) High pressure air or gas compressors shall be equipped with "automatic stop" safety devices set for desired pressure and relief valves set to prevent inadvertent over-pressurization of the system.

- e) Compressed air systems over 500 psig shall have slow-opening shut-off valves.
- f) Low-pressure compressors used to supply air directly to the diver if equipped with a volume tank shall have a check valve on the inlet side, a relief valve, and a drain valve.

Oxygen Safety

- a) Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed and maintained for oxygen service.
- b) Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before being placed into service.
- c) Oxygen systems over 125 psig shall have slow-opening shut-off valves.

3.50 Equipment Maintenance

Record Keeping

Each equipment modification, repair, test, calibration, or maintenance service shall be logged, including the date and nature of work performed, serial number of the item, and the name of the person performing the work. Service logs of personal dive equipment that is used for work shall be submitted to the DSO. FAU dive equipment and personal dive equipment that is used for work shall be maintained and tested according FAU equipment standards in Section 3.20. Records of maintenance shall be maintained for:

- a) Regulators
- b) Submersible pressure gauges
- c) Scuba cylinders
- d) Cylinder valves
- e) Diving helmets
- f) Submersible breathing masks
- g) Compressors
- h) Gas control panels
- i) Air storage cylinders
- j) Air filtration systems
- k) Analytical instruments
- l) Buoyancy control devices
- m) Dry suits

Air and Gas Analysis

- a) Gas analyses and air tests shall be performed on FAU breathing air compressors at regular intervals of no more than 100 hours of operation or 6 months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained.
- b) A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

3.60 Air Quality Standards

Breathing air for scuba shall meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1).

CGA Grade E	
Component	Maximum
Oxygen	20 - 22%/v
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Hydrocarbons	5 mg/m ³
Total Hydrocarbons as Methane	25 PPM/v
Water Vapor ppm	(2)
Objectionable Odors	None

For breathing air used in conjunction with self-contained breathing apparatus in extreme cold where moisture can condense and freeze, causing the breathing apparatus to malfunction, a dew point not to exceed -50°F (63 pm v/v) or 10 degrees lower than the coldest temperature expected in the area is required.

SECTION 4.00 CERTIFICATION AND TRAINING REQUIREMENTS

No person (whether an FAU employee or not) shall engage in diving on any FAU project, from any FAU vessel or small boat, or use FAU equipment unless that person is authorized to dive by the FAU Diving Safety Officer and according to the standards of this manual. Application for permit to dive shall be made by the prospective diver to the FAU DSO. Once the following prerequisites and standards are completed, the Diving Safety Officer through the authority of the FAU Diving and Boating Safety Committee may issue either a Temporary Diver Permit or a Scientific Diver Certification.

4.10 Entry Level Training Requirements

Training and certification as an entry-level diver is a prerequisite to AAUS Scientific Diver Training. In lieu of writing/promulgating AAUS specific standards for entry-level divers, AAUS references here, the standards for entry-level diver training as defined by the WRSTC and/or ISO. AAUS programs who wish to train entry-level divers may do so using one of the following options:

- a) under the auspices and standards of an internationally recognized diver training agency.
- b) under the auspices of AAUS using the minimum guidelines presented by the most current version of the RSTC/WRSTC and/or ISO entry-level diver standards.

4.20 References

“Minimum Course Content for Open Water Diver Certification”- World Recreational Scuba Training Council (WRSTC), www.wrstc.com.

“Safety related minimum requirements for the training of recreational scuba divers -- Part 2: Level 2 -- Autonomous diver”. ISO 24801-2:2007- International Organization for Standardization (ISO)- www.iso.org.

SECTION 5.00 SCIENTIFIC DIVER AND OTHER DIVER CERTIFICATIONS

This section describes the training and performance standards for AAUS Scientific Divers. These standards represent the minimum required level of knowledge and skills presented in a generalized format. All diver authorizations under the auspices of FAU fall into one of two categories, Scientific Diver, or Temporary Diver (Scientific Diver-in-Training), described in Section 5.34.

5.10 Prerequisites

Administrative

The applicant/candidate must complete all administrative and legal documentation required by Florida Atlantic University.

Diver Certification

The applicant/candidate must, at minimum, show documented proof of entry-level diver certification from an internationally recognized training agency. As an alternative, Florida Atlantic University may train and certify entry-level divers under AAUS auspices under the guidelines presented in Section 4.0.

Medical Examination

The applicant/candidate must be medically qualified for diving as described in Section 6.0 of the Florida Atlantic University Standards for Scientific Diving.

Swimming/Watermanship Evaluation

The applicant/candidate must demonstrate the following in the presence of the Diving Safety Officer, instructor, or other approved examiner. All tests are to be performed without swim aids, however, where exposure protection is needed, the applicant must be appropriately weighted to provide for neutral buoyancy.

- a) Swim underwater for a distance of 25 yards/meters without surfacing.
- b) Swim 400 yards/meters in less than 12 minutes.
- c) Tread water for 10 minutes, or 2 minutes without the use of hands.
- d) Transport a passive person of equal size a distance of 25 yards/meters in the water.

Waiver

Waiver and Release Form (Appendix B).

Exceptions:

- a) FAU employees may, in lieu of a signed waiver, provide proof through Human Resources of current employment status.

Approved Diving Equipment

Approved Diving Equipment Form (Appendix K.) Must include proof of SCUBA regulator, DCB, and computer service within the preceding 12 months.

5.20 Training

The diver must complete theoretical aspects and practical training for a minimum cumulative time of 100 hours. Theoretical aspects shall include principles and activities appropriate to the intended area of scientific study.

Theoretical Training/ Knowledge Development

Required Topics:

1. Diving Emergency Care Training
 - Cardiopulmonary Resuscitation (CPR)
 - Standard or Basic First Aid
 - Recognition of DCS and AGE
 - Accident Management
 - Field Neurological Exam
 - Oxygen Administration
2. Dive Rescue
3. Dive Physics
4. Dive Physiology
5. Dive Environments
6. Decompression Theory and its Application
7. AAUS Scientific Diving Regulations and History
 - Scientific Dive Planning
 - Coordination with other Agencies
 - Appropriate Governmental Regulations
8. Scientific Method
9. Data Gathering Techniques (Only Items specific to area of study required)

- Transect Sampling (Quadrating)
- Transecting
- Mapping
- Coring
- Photography
- Tagging
- Collecting
- Animal Handling
- Archaeology
- Common Biota
- Organism Identification
- Behavior
- Ecology
- Site Selection, Location, and Re-location
- Specialized Equipment for data gathering
- HazMat Training
- HP Cylinders
- Chemical Hygiene, Laboratory Safety (Use Of Chemicals)

Suggested Topics:

10. Specific Dive Modes (methods of gas delivery)
 - Open Circuit
 - Hooka
 - Surface Supplied diving
11. Small Boat Operation
12. Rebreathers
 - Closed

- Semi-closed
- 13. Specialized Breathing Gas
 - Nitrox
 - Mixed Gas
- 14. Specialized Environments and Conditions
 - Blue Water Diving,
 - Ice and Polar Diving (Cold Water Diving)
 - Zero Visibility Diving
 - Polluted Water Diving
 - Saturation Diving
 - Decompression Diving
 - Overhead Environments
 - Aquarium Diving
 - Night Diving
 - Kelp Diving
 - Strong Current Diving (Live-boating)
 - Potential Entanglement
- 15. Specialized Diving Equipment
 - Full face mask
 - Dry Suit
 - Communications

Practical Training/ Skill Development

Confined Water Evaluation

At the completion of training, the trainee must satisfy the Diving Safety Officer or the instructor of their ability to perform the following, as a minimum, in a pool or in sheltered water:

- a) Enter water with full equipment.
- b) Clear face mask.

- c) Demonstrate air sharing, including both buddy breathing and the use of alternate air source, as both donor and recipient, with and without a face mask.
- d) Demonstrate ability to alternate between snorkel and scuba while kicking.
- e) Demonstrate understanding of underwater signs and signals.
- f) Demonstrate simulated in-water mouth-to-mouth resuscitation.
- g) Rescue and transport, as a diver, a passive simulated victim of an accident.
- h) Demonstrate ability to remove and replace equipment while submerged.
- i) Demonstrate watermanship ability, which is acceptable to the instructor.

Open Water Evaluation

The trainee must satisfy an instructor, approved by the Diving Safety Officer, of their ability to perform at least the following in open water:

- a) Surface dive to a depth of 10 feet in open water without scuba.
- b) Demonstrate proficiency in air sharing as both donor and receiver.
- c) Enter and leave open water or surf, or leave and board a diving vessel, while wearing scuba gear.
- d) Kick on the surface 400 yards while wearing scuba gear, but not breathing from the scuba unit.
- e) Demonstrate judgment adequate for safe diving.
- f) Demonstrate, where appropriate, the ability to maneuver efficiently in the environment, at and below the surface.
- g) Complete a simulated emergency swimming ascent.
- h) Demonstrate clearing of mask and regulator while submerged.
- i) Demonstrate ability to achieve and maintain neutral buoyancy while submerged.
- j) Demonstrate techniques of self-rescue and buddy rescue.
- k) Navigate underwater.
- l) Plan and execute a dive.

Checkout Dive/ Additional Experience

Practical training must include an Open Water checkout dive(s), with evaluation of the skills listed in Open Water Evaluation, with the DSO or qualified delegate followed by at least 11

ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of 6 hours. Dives following the checkout dive must be supervised by a certified Scientific Diver with experience in the type of diving planned, with the knowledge and permission of the DSO.

5.30 Examinations

Written Exams

Before completing training, the trainee must pass a written examination that demonstrates knowledge of at least the following:

- a) Function, care, use, and maintenance of diving equipment.
- b) Physics and physiology of diving.
- c) Diving regulations and precautions.
- d) Near-shore currents and waves.
- e) Dangerous marine animals.
- f) Emergency procedures, including buoyant ascent and ascent by air sharing.
- g) Currently accepted decompression procedures.
- h) Demonstrate the proper use of dive tables.
- i) Underwater communications.
- j) Aspects of freshwater and altitude diving.
- k) Hazards of breath-hold diving and ascents.
- l) Planning and supervision of diving operations.
- m) Diving hazards.
- n) Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, carbon dioxide excess, squeezes, oxygen poisoning, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia.
- o) Suggested topics (from Sec. 5.20) at the DSO's discretion.

Equipment

The trainee will be subject to examination/review of:

- a) Personal diving equipment
- b) Task specific equipment

5.40 Diver Permits/Certifications

Florida Atlantic University requires that no person shall engage in scientific diving unless that person is authorized by an organizational member pursuant to the provisions of this standard. Only a person diving under the auspices of Florida Atlantic University that subscribes to the practices of AAUS is eligible for a scientific diver certification.

Scientific Diver-In-Training Permit

This is a permit to dive, usable only while it is current and for the purpose intended. This permit signifies that a diver has completed and been certified as at least an entry level diver through an internationally recognized certifying agency or scientific diving program, and has the knowledge skills and experience necessary to continue training as a scientific diver under supervision, as approved by the DSO.

Scientific Diver Certification

This permit signifies a diver has completed all requirements in Section 5.0 and is authorized by the Florida Atlantic University to engage in scientific diving without supervision, as approved by the DSO. Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince the Diving Safety Officer and members of the DBSC that they are sufficiently skilled and proficient to be certified. This skill will be acknowledged by the signature of the Diving Safety Officer. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied FAU scientific diving privileges.

5.50 Depth Certifications

Depth Certifications and Progression to Next Depth Level

A certified diver diving under the auspices of the organizational member may progress to the next depth level after successfully completing the required dives for the next level. Under these circumstances the diver may exceed their depth limit. Dives shall be planned and executed under close supervision of a diver certified to this depth, with the knowledge and permission of the DSO.

- a) Certification to 30 Foot Depth - Initial permit level, approved upon the successful completion of training listed in Section 4.00 and 5.00.
- b) Certification to 60 Foot Depth - A diver holding a 30 foot certificate may be certified to a depth of 60 feet after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours.
- c) Certification to 100 Foot Depth - A diver holding a 60 foot certificate may be certified to a depth of 100 feet after successfully completing, 4 dives to depths between 61 and 100 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.
- d) Certification to 130 Foot Depth - A diver holding a 100 foot certificate may be certified to a depth of 130 feet after successfully completing, 4 dives to depths between 100 and

130 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

- e) Certification to 150 Foot Depth - A diver holding a 130 foot certificate may be certified to a depth of 150 feet after successfully completing, 4 dives to depths between 130 and 150 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.
- f) Certification to 190 Foot Depth - A diver holding a 150 foot certificate may be certified to a depth of 190 feet after successfully completing, 4 dives to depths between 150 and 190 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

Diving on air is not permitted beyond a depth of 190 feet.

5.60 Continuation of Certificate

Minimum Activity to Maintain Certification

During any 12-month period, each certified scientific diver must log a minimum of 12 dives. At least one dive must be logged near the maximum depth of the diver's certification during each 6-month period. Divers certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or over. Failure to meet these requirements may be cause for revocation or restriction of certification.

Re-qualification of Depth Certificate

Once the initial certification requirements of Section 5.00 are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by the DBSC.

Medical Examination

All certified scientific divers shall pass a medical examination at the intervals specified in Section 6.0. After each major illness or injury, as described in Section 6.0, a certified scientific diver shall receive clearance to return to diving from a physician before resuming diving activities.

Emergency Care Training

The scientific diver must provide proof of training in the following:

- Adult CPR (must be current).
- Emergency oxygen administration (must be current)
- First aid for diving accidents (must be current)

5.70 Revocation of Certification

A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the DBSC. Violations of regulations set forth in this standard, or other governmental subdivisions not in conflict with this standard, may be considered cause. Diving Safety Officer shall inform the diver in writing of the reason(s) for revocation. The diver will be given the opportunity to present their case in writing for reconsideration and/or re-certification. All such written statements and requests, as identified in this section, are formal documents, which will become part of the diver's file.

5.80 Recertification

If a diver's certificate expires or is revoked, they may be re-certified after complying with such conditions as the Diving Safety Officer or the DBSC may impose. The diver shall be given an opportunity to present their case to the DBSC before conditions for re-certification are stipulated.

5.90 Waiver of Requirements/Temporary Diver

A temporary diver permit constitutes a waiver of the requirements of Section 5.0 and is issued only following a demonstration of the required proficiency in diving. It is valid only for a limited time, as determined by the Diving Safety Officer. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this standard.

Requirements of Section 5.0 may be waived by the Diving Safety Officer if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. A statement of the temporary diver's qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. Temporary permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this standard, including medical requirements.

SECTION 6.00 MEDICAL STANDARDS

6.10 Medical Requirements

General

- a) The organizational member shall determine that divers have passed a current diving physical examination and have been declared by the examining physician to be fit to engage in diving activities as may be limited or restricted in the medical evaluation report.
- b) All medical evaluations required by this standard shall be performed by, or under the direction of, a licensed physician of the applicant-diver's choice, preferably one trained in diving/undersea medicine.
- c) The diver should be free of any chronic disabling disease and any conditions contained in the list of conditions for which restrictions from diving are generally recommended. (Appendix 1)

6.20 Frequency of Medical Evaluations

Medical evaluation shall be completed:

- a) Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years (3 years if over the age of 40, 2 years if over the age of 60), the member organization has obtained the results of that examination, and those results have been reviewed and found satisfactory by the member organization.
- b) Thereafter, at 5 year intervals up to age 40, every 3 years after the age of 40, and every 2 years after the age of 60.
- c) Clearance to return to diving must be obtained from a physician following any major injury or illness, or any condition requiring hospital care or chronic medication. If the injury or illness is pressure related, then the clearance to return to diving must come from a physician trained in diving medicine.

6.30 Information Provided Examining Physician

The organizational member shall provide a copy of the medical evaluation requirements of this standard to the examining physician. (Appendices 1, 2, and 3).

6.40 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 6.10 shall consist of the following:

- a) Applicant agreement for release of medical information to the Diving Safety Officer and the DCB (Appendix 2).
- b) Medical history (Appendix 3).
- c) Diving physical examination (Required tests listed below and in Appendix 2).

6.50 Conditions Which May Disqualify Candidates From Diving (Adapted from Bove, 1998)

- a) Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to auto inflate the middle ears.
- b) Hearing loss; Vertigo including Meniere's Disease.
- c) Stapedectomy or middle ear reconstructive surgery.
- d) Recent ocular surgery.
- e) Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, depression.
- f) Substance abuse, including alcohol.
- g) Episodic loss of consciousness.
- h) History of seizure.
- i) History of stroke or a fixed neurological deficit.
- j) Recurring neurologic disorders, including transient ischemic attacks.
- k) History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
- l) History of neurological decompression illness with residual deficit.
- m) Head injury.
- n) Hematologic disorders including coagulopathies.
- o) Risk factors or evidence of coronary artery disease.
- p) Atrial septal defects.
- q) Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.
- r) Significant cardiac rhythm or conduction abnormalities.
- s) Implanted cardiac pacemakers and cardiac defibrillators (ICD).
- t) Inadequate exercise tolerance.
- u) Hypertension.
- v) History of pneumothorax.
- w) Asthma.

- x) Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
- y) Diabetes mellitus.
- z) Pregnancy.

6.60 Laboratory Requirements for Diving Medical Evaluation and Intervals

Initial examination under age 40:

- a) Medical History
- b) Complete Physical Exam, emphasis on neurological and otological components
- c) Urinalysis
- d) Any further tests deemed necessary by the physician.

Periodic re-examination under age 40 (every 5 years):

- a) Medical History
- b) Complete Physical Exam, emphasis on neurological and otological components
- c) Urinalysis
- d) Any further tests deemed necessary by the physician

First exam over age 40:

- a) Medical History
- b) Complete Physical Exam, emphasis on neurological and otological components
- c) Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment^{1,2} (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
- d) Resting EKG
- e) Chest X-ray
- f) Urinalysis
- g) Any further tests deemed necessary by the physician

Periodic re-examination over age 40 (every 3 years); over age 60 (every 2 years):

- a) Medical History
- b) Complete Physical Exam, emphasis on neurological and otological components
- c) Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment¹ (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
- d) Resting EKG
- e) Urinalysis
- f) Any further tests deemed necessary by the physician

6.70 Physician's Written Report

After any medical examination relating to the individual's fitness to dive, the organizational member shall obtain a written report prepared by the examining physician that shall contain the examining physician's opinion of the individual's fitness to dive, including any recommended restrictions or limitations. This report will be reviewed by the DBSC.

The organizational member shall make a copy of the physician's written report available to the individual.

¹ Grundy, R.J. et. al. 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

² Bove, A.A. 2011. The cardiovascular system and diving risk. *Undersea and Hyperbaric Medicine* 38(4): 261-269.

VOLUME II

Florida Atlantic University Specialized Diving Modes

SECTION 7.00 NITROX DIVING GUIDELINES

The following guidelines address the use of nitrox by scientific divers under the auspices Florida Atlantic University. Nitrox is defined for these guidelines as breathing mixtures composed predominately of nitrogen and oxygen, most commonly produced by the addition of oxygen or the removal of nitrogen from air.

7.10 Prerequisites

Eligibility

Only a certified Scientific Diver or Scientific Diver In Training (Sections 4.00 and 5.00) diving under the auspices Florida Atlantic University is eligible for authorization to use nitrox. After completion, review and acceptance of application materials, training and qualification, an applicant will be authorized to use nitrox within their depth authorization, as specified in Section 5.40.

Application and Documentation

Application and documentation for authorization to use nitrox should be made on forms specified by the Diving and Boating Safety Committee.

7.20 Requirements for Authorization to Use Nitrox

Submission of documents and participation in aptitude examinations does not automatically result in authorization to use nitrox. The applicant must convince the DSO and members of the DBSC that they are sufficiently skilled and proficient. The signature of the DSO on the authorization form will acknowledge authorization. After completion of training and evaluation, authorization to use nitrox may be denied to any diver who does not demonstrate to the satisfaction of the DSO or DBSC the appropriate judgment or proficiency to ensure the safety of the diver and dive buddy.

Prior to authorization to use nitrox, the following minimum requirements should be met:

Training

The diver must complete additional theoretical and practical training beyond the Scientific Diver In Training air certification level, to the satisfaction of the DSO and DBSC (Section 7.30).

Examinations

Each diver should demonstrate proficiency in skills and theory in written, oral, and practical examinations covering:

- a) Written examinations covering the information presented in the classroom training session(s) (i.e., gas theory, oxygen toxicity, partial pressure determination, etc.);
- b) Practical examinations covering the information presented in the practical training session(s) (i.e., gas analysis, documentation procedures, etc.);
- c) Open water checkout dives, to appropriate depths, to demonstrate the application of theoretical and practical skills learned.

Minimum Activity to Maintain Authorization

The diver should log at least one nitrox dive per year. Failure to meet the minimum activity level may be cause for restriction or revocation of nitrox authorization.

7.30 Nitrox Training Guidelines

Training in these guidelines should be in addition to training for Diver-In-Training authorization (Section 4.00). It may be included as part of training to satisfy the Scientific Diver training requirements (Section 5.30).

Classroom Instruction

- a) Topics should include, but are not limited to: review of previous training; physical gas laws pertaining to nitrox; partial pressure calculations and limits; equivalent air depth (EAD) concept and calculations; oxygen physiology and oxygen toxicity; calculation of oxygen exposure and maximum safe operating depth (MOD); determination of decompression schedules (both by EAD method using approved air dive tables, and using approved nitrox dive tables); dive planning and emergency procedures; mixing procedures and calculations; gas analysis; personnel requirements; equipment marking and maintenance requirements; dive station requirements.
- b) DSO may choose to limit standard nitrox diver training to procedures applicable to diving, and subsequently reserve training such as nitrox production methods, oxygen cleaning, and dive station topics to divers requiring specialized authorization in these areas.

Practical Training

The practical training portion will consist of a review of skills as stated for scuba (Section 4.00), with additional training as follows:

- a) Oxygen analysis of nitrox mixtures.
- b) Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths.
- c) Determination of nitrogen-based dive limits status by EAD method using air dive tables, and/or using nitrox dive tables, as approved by the DCB.
- d) Nitrox dive computer use may be included, as approved by the DSO.

Written Examination (based on classroom instruction and practical training)

Before authorization, the trainee should successfully pass a written examination demonstrating knowledge of at least the following:

- a) Function, care, use, and maintenance of equipment cleaned for nitrox use.
- b) Physical and physiological considerations of nitrox diving (ex.: O₂ and CO₂ toxicity).
- c) Diving regulations and procedures as related to nitrox diving, either scuba or surface-supplied (depending on intended mode).

- d) Given the proper information, calculation of:
 - 1. Equivalent air depth (EAD) for a given fO_2 and actual depth;
 - 2. pO_2 exposure for a given fO_2 and depth;
 - 3. Optimal nitrox mixture for a given pO_2 exposure limit and planned depth;
 - 4. Maximum operational depth (MOD) for a given mix and pO_2 exposure limit;
 - 5. For nitrox production purposes, percentages/psi of oxygen present in a given mixture, and psi of each gas required to produce a fO_2 by partial pressure mixing.
- e) Dive table and dive computer selection and usage;
- f) Nitrox production methods and considerations.
- g) Oxygen analysis.
- h) Nitrox operational guidelines (Section 7.40), dive planning, and dive station components.

Open Water Dives

A minimum of two supervised open water dives using nitrox is required for authorization. The mode used in the dives should correspond to the intended application (i.e., scuba or surface-supplied). If the MOD for the mix being used can be exceeded at the training location, direct, in-water supervision is required.

Surface-Supplied Training

All training as applied to surface-supplied diving (practical, classroom, and open water) will follow Florida Atlantic University's surface-supplied diving standards, including additions listed in Section 11.60.

7.40 Scientific Nitrox Diving Regulations

Dive Personnel Requirements

- a) Nitrox Diver In Training - A Diver In Training, who has completed the requirements of Section 4.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox under the direct supervision a Scientific Diver who also holds nitrox authorization. Dive depths should be restricted to those specified in the diver's authorization.
- b) Scientific Diver - A Scientific Diver who has completed the requirements of Section 5.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox. Depth authorization to use nitrox should be the same as those specified in the diver's authorization, as described in Section. 5.40.
- c) Lead Diver - On any dive during which nitrox will be used by any team member, the Lead Diver should be authorized to use nitrox, and hold appropriate authorizations required for the dive, as specified in Florida Atlantic University Standards. Lead Diver authorization for nitrox dives by the DSO and/or DCB should occur as part of the dive plan approval process.

In addition to responsibilities listed in Section 1.20, the Lead Diver should:

- 1. As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized;

2. As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among the team members.
3. The Lead Diver should also reduce the maximum allowable pO₂ exposure limit for the dive team if on-site conditions so indicate (see Sec. 7.42.).

Dive Parameters

a) Oxygen Exposure Limits

1. The inspired oxygen partial pressure experienced at depth should not exceed 1.6 ATA. All dives performed using nitrox breathing mixtures should comply with the current *NOAA Diving Manual* "Oxygen Partial Pressure Limits for 'Normal' Exposures"
2. The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected. The DBSC should consider this in the review of any dive plan application, which proposes to use nitrox. The Lead Diver should also review on-site conditions and reduce the allowable pO₂ exposure limits if conditions indicate.
3. If using the equivalent air depth (EAD) method the maximum depth of a dive should be based on the oxygen partial pressure for the specific nitrox breathing mix to be used.

b) Bottom Time Limits

1. Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.
2. Bottom time for a single dive should not exceed the NOAA maximum allowable "Single Exposure Limit" for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.

c) Dive Tables and Gases

1. A set of DBSC approved nitrox dive tables should be available at the dive site.
2. When using the equivalent air depth (EAD) method, dives should be conducted using air dive tables approved by the DCB.
3. If nitrox is used to increase the safety margin of air-based dive tables, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded
4. Breathing mixtures used while performing in-water decompression, or for bail-out purposes, should contain the same or greater oxygen content as that being used during the dive, within the confines of depth limitations and oxygen partial pressure limits set forth in Section 7.40 Dive Parameters.

d) Nitrox Dive Computers

1. Dive computers may be used to compute decompression status during nitrox dives. Manufacturers' guidelines and operations instructions should be followed.
2. Use of Nitrox dive computers should comply with dive computer guidelines included in the FAU Standards.

3. Nitrox dive computer users should demonstrate a clear understanding of the display, operations, and manipulation of the unit being used for nitrox diving prior to using the computer, to the satisfaction of the DSO or designee.
4. If nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.
5. Dive computers capable of pO₂ limit and fO₂ adjustment should be checked by the diver prior to the start each dive to assure compatibility with the mix being used.

e) Repetitive Diving

1. Repetitive dives using nitrox mixtures should be performed in compliance with procedures required of the specific dive tables used.
2. Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive, and not that of the previous dive.
3. The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24 hour period should not exceed the current *NOAA Diving Manual* 24-hour Oxygen Partial Pressure Limits for “Normal” Exposures.
4. When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.

f) Oxygen Parameters

1. Authorized Mixtures - Mixtures meeting the criteria outlined in Section 7.40 may be used for nitrox diving operations, upon approval of the DCB.
2. Purity - Oxygen used for mixing nitrox-breathing gas should meet the purity levels for “Medical Grade” (U.S.P.) or “Aviator Grade” standards.

In addition to the AAUS Air Purity Guidelines (Section 3.60), the following standard should be met for breathing air that is either:

- a. Placed in contact with oxygen concentrations greater than 40%.
- b. Used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent.

Air Purity: CGA Grade E (Section 3.60)	
Condensed Hydrocarbons	5mg/m ³
Hydrocarbon Contaminants	No greater than 0.1 mg/m ³

g) Gas Mixing and Analysis for Organizational Members

1. Personnel Requirements

- a. Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.
 - b. Only those individuals approved by the DSO and/or DBSC should be responsible for mixing and/or analyzing nitrox mixtures.
2. Production Methods - It is the responsibility of the DBSC to approve the specific nitrox production method used.
 3. Analysis Verification by User
 - a. It is the responsibility of each diver to analyze prior to the dive the oxygen content of the diver's scuba cylinder and acknowledge in writing the following information for each cylinder: fO₂, MOD, cylinder pressure, date of analysis, and user's name.
 - b. Individual dive log reporting forms should report fO₂ of nitrox used, if different than 21%.

7.50 Nitrox Diving Equipment

All of the designated equipment and stated requirements regarding scuba equipment required in the FAU Standards should apply to nitrox scuba operations. Additional minimal equipment necessary for nitrox diving operations includes:

- Labeled SCUBA Cylinders
- Oxygen Analyzers

Oxygen Cleaning and Maintenance Requirements

- a) Requirement for Oxygen Service
 1. All equipment, which during the dive or cylinder filling process is exposed to concentrations greater than 40% oxygen at pressures above 150 psi, should be cleaned and maintained for oxygen service.
 2. Equipment used with oxygen or mixtures containing over 40% by volume oxygen shall be designed and maintained for oxygen service. Oxygen systems over 125 psig shall have slow-opening shut-off valves. This should include the following equipment: scuba cylinders, cylinder valves, scuba and other regulators, cylinder pressure gauges, hoses, diver support equipment, compressors, and fill station components and plumbing.
- b) Scuba Cylinder Identification Marking
 1. Scuba cylinders to be used with nitrox mixtures should have the following identification documentation affixed to the cylinder.
 2. Cylinders should be marked "NITROX", or "EANx", or "Enriched Air".
 3. Nitrox identification color-coding should include a 4-inch wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 1-inch yellow band.

4. The alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word "NITROX" parallel to the length of the cylinder in green print is acceptable.
 5. Other markings, which identify the cylinder as containing gas mixes other than Air, may be used as the approval of the DCB.
 6. A contents label should be affixed, to include the current fO_2 , date of analysis, and MOD.
 7. The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.
- c) Regulators - Regulators to be used with nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service, and marked in an identifying manner.
- d) Other Support Equipment
1. An oxygen analyzer is required which is capable of determining the oxygen content in the scuba cylinder. Two analyzers are recommended to reduce the likelihood of errors due to a faulty analyzer. The analyzer should be capable of reading a scale of 0 to 100% oxygen, within 1% accuracy.
 2. All diver and support equipment should be suitable for the fO_2 being used.
- e) Compressor system
1. Compressor/filtration system must produce oil-free air.
 2. An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.
- f) Fill Station Components - All components of a nitrox fill station that will contact nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service. This includes cylinders, whips, gauges, valves, and connecting lines.

SECTION 8.00 AQUARIUM DIVING OPERATIONS

8.10 General Policy

Section 8.00 applies to scientific aquarium divers only.

Definition - A scientific aquarium diver is a scientific diver who is diving solely within an aquarium. An aquarium is a shallow, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research.

It is recognized that within scientific aquarium diving there are environments and equipment that fall outside the scope of those addressed in this standard. In those circumstances it is the responsibility of the FAU Diving and Boating Safety Committee to establish the requirements and protocol under which diving will be safely conducted.

Note: All of the standards set forth in other sections of this standard shall apply, except as otherwise provided in this section.

8.20 The Buddy System In Scientific Aquarium Diving

All scuba diving activities in the confined environment of an aquarium shall be conducted in accordance with the buddy system, whereby both divers, or a diver and a tender as provided below, are always in visual contact with one another, can always communicate with one another, and can always render prompt and effective assistance either in response to an emergency or to prevent an emergency.

A diver and tender comprise a buddy team in the confined environment of an aquarium only when the maximum depth does not exceed 30 feet, and there are no overhead obstructions or entanglement hazards for the diver, and the tender is equipped, ready and able to conduct or direct a prompt and effective in-water retrieval of the diver at all times during the dive.

8.30 Diving Equipment

Section 3.20 is modified to read as follows:

In an aquarium of a known maximum obtainable depth:

- a) A depth indicator is not required, except that a repetitive diver shall use the same computer used on any prior dive.
- b) Only one buddy must be equipped with a timing device.
- c) The maximum obtainable depth of the aquarium shall be used as the diving depth.

8.40 Scientific Aquarium Diver Certification

A Scientific Aquarium Diver is a certification enabling the qualified diver to participate in scientific diving in accordance with Section 8.00 as provided below.

All of the standards set forth in sections 4.0 and 5.0 of this standard shall apply, except that Section 5.30 of this standard is modified to read as follows:

Practical training shall include at least 12 supervised aquarium dives for a cumulative bottom time of 6 hours. No more than 3 of these dives shall be made in 1 day.

8.50 Scientific Aquarium Diving Using Other Diving Technology

Surface Supplied Scientific Aquarium Diving

Definition: For purposes of scientific aquarium diving, surface supplied diving is described as a mode of diving using open circuit, surface supplied compressed gas which is provided to the diver at the dive location and may or may not include voice communication with the surface tender.

- a) Divers using the surface supplied mode shall be equipped with a diver-carried independent reserve breathing gas supply.

Scientific aquarium divers using conventional scuba masks, full-face masks, or non-lockdown type helmets are exempt from this standard provided:

1. There are no overhead obstructions or entanglements.
 2. The diver is proficient in performing a Controlled Emergency Swimming Ascent from at least as deep as the maximum depth of the aquarium.
 3. The diver is proficient in performing out of air emergency drills, including ascent and mask/helmet removal.
 4. Each surface supplied diver shall be hose-tended by a separate dive team member while in the water. Scientific aquarium divers are exempt from this standard, provided the tender is monitoring only one air source, there is mutual assistance between divers and there are no overhead obstructions or entanglements.
- b) Divers using the surface supplied mode shall maintain communication with the surface tender. The surface supplied breathing gas supply (volume and intermediate pressure) shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive.
 - c) During surface supplied diving operations when only one diver is in the water, there must be a standby diver in attendance at the dive location. Scientific aquarium divers are exempt from this standard, provided the tender is equipped, ready and able to conduct a prompt and effective in-water retrieval of the diver at all times during the dive.”
 - d) Surface supplied equipment must be configured to allow retrieval of the diver by the surface tender without risk of interrupting air supply to the diver.
 - e) All surface supplied applications used for scientific aquarium diving shall have a non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.

SECTION 9.00 STAGED DECOMPRESSION DIVING

Decompression diving shall be defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body.

Divers conducting decompression diving shall follow current AAUS standards: "Staged Decompression Diving" (American Academy of Underwater Sciences), in addition to all FAU standards.

The following procedures shall be observed when conducting dives requiring planned decompression stops.

9.10 Minimum Experience and Training Requirements

- a) Prerequisites:
 1. No diver shall conduct staged decompression diving without the prior approval of the Diving Safety Officer.
 2. All divers must take a refresher course and examination on the use of dive tables and calculations involved in the planning of decompression dives. This must be completed to qualify to conduct staged decompression diving and again if more than one year lapses between decompression dives. The DSO or designate will administer the refresher course and approve participants.
 3. Scientific Diver qualification according to Section 5.00.
 4. Minimum of 100 logged dives.
 5. Demonstration of the ability to safely plan and conduct dives deeper than 100 feet.
 6. Nitrox certification/authorization according to FAU Section 7.00 recommended.
- b) Training shall be appropriate for the conditions in which dive operations are to be conducted.
- c) Minimum Training shall include the following:
 1. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include: physics and physiology of decompression; decompression planning and procedures; gas management; equipment configurations; decompression method, emergency procedures, and omitted decompression.
 2. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover equipment handling and familiarization, swimming and buoyancy control, to estimate gas consumption rates, and to practice emergency procedures.
 3. At least 6 open-water training dives simulating/requiring decompression shall be conducted, emphasizing planning and execution of required decompression dives, and including practice of emergency procedures.
 4. Progression to greater depths shall be by 4-dive increments at depth intervals as specified in Section 5.40.
 5. No training dives requiring decompression shall be conducted until the diver has

demonstrated acceptable skills under simulated conditions.

6. The following are the minimum skills the diver must demonstrate proficiently during dives simulating and requiring decompression:
 - Buoyancy control
 - Proper ascent rate
 - Proper depth control
 - Equipment manipulation
 - Stage/decompression bottle use as pertinent to planned diving operation
 - Buddy skills
 - Gas management
 - Time management
 - Task loading
 - Emergency skills
7. Divers shall demonstrate to the satisfaction of the DSO or the DSO's qualified designee proficiency in planning and executing required decompression dives appropriate to the conditions in which diving operations are to be conducted.
8. Upon completion of training, the diver shall be authorized to conduct required decompression dives with DSO approval.

9.20 Minimum Equipment Requirements

- a) Valve and regulator systems for primary (bottom) gas supplies shall be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system.
- b) Cylinders with volume and configuration adequate for planned diving operations.
- c) One of the second stages on the primary gas supply shall be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.
- d) Minimum dive equipment shall include:
 1. Snorkel is optional at the DBSC's discretion, as determined by the conditions and environment.
 2. Diver location devices adequate for the planned diving operations and environment.
 3. Compass.
 4. Decompression tables appropriate to cover the dive plan.
- e) Redundancy in the following components is desirable or required at the discretion of the DBSC or DSO:
 1. Decompression Schedules
 2. Dive Timing Devices
 3. Depth gauges
 4. Buoyancy Control Devices
 5. Cutting devices

6. Lift bags and line reels

9.30 Minimum Operational Requirements.

- a) Approval of dive plan applications to conduct required decompression dives shall be on a case-by-case basis.
- b) The maximum pO_2 to be used for planning required decompression dives is 1.6. It is recommended that a pO_2 of less than 1.6 be used during bottom exposure.
- c) Diver's gas supplies shall be adequate to meet planned operational requirements and foreseeable emergency situations.
- d) Decompression dives may be planned using dive tables, dive computers, and/or PC software approved by the DSO/DCB.
- e) Breathing gases used while performing in-water decompression shall contain the same or greater oxygen content as that used during the bottom phase of the dive.
- f) The dive team prior to each dive shall review emergency procedures appropriate for the planned dive.
- g) If breathing gas mixtures other than air are used for required decompression, their use shall be in accordance with those regulations set forth in the appropriate sections of this standard.
- h) The maximum depth for required decompression using air as the bottom gas shall be 190 feet.
- i) Use of additional nitrox and/or high-oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is encouraged.
- j) Use of alternate inert gas mixtures to limit narcosis is encouraged for depths greater than 150 feet.
- k) If a period of more than 6 months has elapsed since the last decompression dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.
- l) Mission specific workup dives are recommended.

SECTION 10.00 MIXED GAS DIVING

Mixed gas diving is defined as dives done while breathing gas mixes containing proportions greater than 1% by volume of an inert gas other than nitrogen.

10.10 Minimum Experience and Training Requirements

- a) Prerequisites:
 1. Nitrox certification and authorization (Section 7.00)
 2. If the intended use entails required decompression stops, divers will be previously certified and authorized in decompression diving (Section 9.00).
 3. Divers shall demonstrate to the DSO's satisfaction skills, knowledge, and attitude appropriate for training in the safe use of mixed gases.
- b) Classroom training including:
 1. Review of topics and issues previously outlined in nitrox and required decompression diving training as pertinent to the planned operations.
 2. The use of helium or other inert gases, and the use of multiple decompression gases.
 3. Equipment configurations
 4. Mixed gas decompression planning
 5. Gas management planning
 6. Thermal considerations
 7. END determination
 8. Mission planning and logistics
 9. Emergency procedures
 10. Mixed gas production methods
 11. Methods of gas handling and cylinder filling
 12. Oxygen exposure management
 13. Gas analysis
 14. Mixed gas physics and physiology
- c) Practical Training:
 1. Confined water session(s) in which divers demonstrate proficiency in required skills and techniques for proposed diving operations.
 2. A minimum of 6 open water training dives.
 3. At least one initial dive shall be in 130 feet or less to practice equipment handling and emergency procedures.
 4. Subsequent dives will gradually increase in depth, with a majority of the training dives being conducted between 130 feet and the planned operational depth.

5. Planned operational depth for initial training dives shall not exceed 260 feet.
6. Diving operations beyond 260 feet requires additional training dives.

10.20 Equipment and Gas Quality Requirements

- a) Equipment requirements shall be developed and approved by the DBSC, and met by divers, prior to engaging in mixed-gas diving. Equipment shall meet other pertinent requirements set forth elsewhere in this standard.
- b) The quality of inert gases used to produce breathing mixtures shall be of an acceptable grade for human consumption.

10.30 Minimum Operational Requirements

- a) Approval of dive plan applications to conduct mixed gas dives shall be on a case-by-case basis.
- b) All applicable operational requirements for nitrox and decompression diving shall be met.
- c) The maximum pO_2 to be used for planning required decompression dives is 1.6. It is recommended that a pO_2 of less than 1.6 be used during bottom exposure.
- d) Maximum planned Oxygen Toxicity Units (OTU) will be considered based on mission duration.
- e) Divers decompressing on high-oxygen concentration mixtures shall closely monitor one another for signs of acute oxygen toxicity.

If a period of more than 6 months has elapsed since the last mixed gas dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.

SECTION 11.00 SPECIALTY AND OTHER DIVING TECHNOLOGYS

Certain types of diving require specialized equipment or procedures that require training; some have specialized standards which have been developed by AAUS and other agencies. Florida Atlantic University scientific divers, in addition to all other standards contained in this manual, shall comply with all diving procedures and training requirements defined by the DSO and DBSC for specialized diving techniques as defined in this Section.

Prior to diving with equipment or procedures listed below, the diver must be approved by the FAU Diving Safety Officer. All current AAUS standards must be followed and certification may require additional courses and testing. Divers shall comply with all scuba procedures and standards in this manual unless specifically waived by the DSO.

Specialty diving

Certain types of diving not previously addressed require additional training. The following types of diving are Specialties that require special training:

- Dive Computer
- Blue water
- Ice and Polar
- Overhead Environments
- Hookah
- Surface Supplied
- Altitude
- Penetration wreck
- Tethered
- Dry suit
- Full face mask
- Nitrox (see Section 7.00)
- Aquarium and Confined Water (see Section 8.00)
- Decompression (see Section 9.00)
- Mixed Gas (see Section 10.00)
- Rebreathers and Closed Circuit (see Section 12.00)
- Cave and Cavern (see Section 13.00)

11.05 Dive Computers

Before using a dive computer as a means of determining decompression status, diver shall complete an appropriate training session and pass a written examination through the DSO. Standards for use of dive computers are listed in Appendix 8.

11.10 Blue Water Diving

Blue water diving is defined as diving in open water where the bottom is generally greater than 200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in “Blue Water Diving Guidelines” (California Sea Grant Publ. No. T-CSGCP-014).

Operational Requirements

1. Bluewater diving authorization will be acknowledged by the signed initials of the DSO on the FAU Scientific Diver authorization card.
2. Procedures for diver control and communication must be developed to the satisfaction of the DSO and/or DBSC.
3. Divers shall employ a down-line and counterweighted trapeze line system in order to maintain diver contact and depth control.
4. A safety diver shall be stationed at the trapeze attachment point. This diver's sole function is to monitor and control the dive team, and monitor the diving environment for potential hazards. This diver shall be authorized to terminate diving operations for any or all members of the dive team.

11.20 Ice and Polar Diving

Divers planning to dive under ice or in polar conditions shall follow current AAUS standards: "Guidelines for Conduct of Research Diving", National Science Foundation, Division of Polar Programs, 1990.

11.30 Overhead Environments

Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry and an orientation line shall be used.

Restricted Overhead Environments

Restricted overhead environments include any diving environment in which a direct ascent to the surface is impeded by a physical barrier, including cave, cavern, ice and shipwreck penetration. It does not include underwater arches, lava tubes, opened shipwrecks or kelp forests, in which:

- a) Two divers can easily swim abreast;
- b) There is no significant danger of entrapment or entanglement
- c) Loss of visibility due to siltation is unlikely;
- d) Direct sunlight is always available for illumination.

Operational Requirements

- a) Restricted overhead environment diving authorization will be acknowledged by the signed initials of the DSO on the FAU Scientific Diver authorization card.
- b) Divers shall immediately begin exiting from a restricted overhead environment when a light source or a piece of equipment fails or malfunctions.
- c) Divers shall begin exiting the overhead environment as soon as any member of the dive team reaches two-thirds of their starting air supply.

- d) Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry, an orientation line shall be used, and an emergency breathing gas supply will be available at the point of entry.
- e) Emergency procedures for loss of gas supply, equipment malfunction, team separation, unexpected diving conditions and loss of visibility shall be developed, and shall be reviewed by divers prior to each dive.

11.40 Saturation Diving

In order to use open circuit compressed air scuba in saturation diving operations, divers must demonstrate and provide proof of training and experience to the satisfaction of the Diving Safety Officer.

11.50 Hookah

While similar to surface supplied systems in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring their own depth, time, and diving profile.

Surface supplied diving Hookah systems are a form of light weight surface supplied air diving technology, involving deck mounted or floating gas supplies (low pressure compressor or compressed gas cylinder), elongated intermediate pressure hoses to divers, and a SCUBA second stage regulator held in a diver's mouth. This technology is usually applied in less than 30 feet, but can be extended to 60 feet. Advantages of hookah systems include fewer burdens on divers, increased gas supply, and a physical connection to the surface. Disadvantages include possible entanglement, risk of gas supply loss, and increased drag and hindrance from hoses in the water column.

Below 60 feet, traditional surface supply systems shall be employed.

Operational Requirements

- a) Hookah divers shall follow buddy diving protocols.
- b) An equipped safety diver capable of safely reaching the divers at the planned depth shall be on standby at the surface.
- c) All hookah divers shall be hose tended by a separate surface tender.
- d) The dive team shall establish effective communication signals between hose tenders and divers.
- e) Divers shall comply with all applicable sections of this manual regarding Scientific Diver training and authorization, equipment inspection and maintenance, air quality testing, record keeping, and operational control.

- f) The hookah gas supply (based on fuel and compressor capacity or surface cylinder volume) shall be sufficient to support all divers attached for the duration of the planned dive, including decompression.
- g) The compressor engine shall not be loaded with fuel until it has been shut off and cooled down for at least 15 minutes.
- h) The fresh air intake must not be located near the compressor exhaust in order to prevent carbon monoxide from being supplied to divers.
- i) All hookah divers shall be equipped with an independent diver-carried breathing gas supply, sufficient to return divers to the surface using safe ascent procedures, including any required decompression stops.

11.60 Surface Supplied Diving

Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the divers' depth, time and diving profile.

Divers using surface supplied diving shall follow current FAU and AAUS standards: "Other Diving Technology- Surface Supplied Diving" (American Academy of Underwater Sciences).

- a) Surface supplied diving shall not be conducted at depths greater than 190 feet.
- b) Divers using surface supply systems shall be equipped with a diver-carried independent reserve breathing gas supply sufficient to return safely to the surface.
- c) Each surface supplied diver shall be hose tended by a separate dive team member.
- d) Divers using the surface supply systems shall maintain voice communication with the surface tender.
- e) The surface supplied breathing gas supply shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive, including decompression.
- f) During surface supplied diving operations, when only one diver is in the water, there must be a standby diver in attendance at the dive location.

11.65 Submerged Laser Safety

In all cases where activated lasers will be deployed with divers present in the water, this standard must be observed. Additional standards presented in the FAU Laser Safety Manual must also be complied with at all times.

Training Requirements

- a) All divers who will be working with or around Class 3B or Class 4 lasers must complete the FAU EHS Laser Safety Course (Basic) prior to participating in activities involving such lasers.
- b) All divers must be briefed by the responsible laboratory manager or PI as to project specific laser procedures prior to participating in activities involving Class 3B or Class 4 lasers.

Operational Requirements

- a) A dive plan must be submitted to the DSO and approved prior to commencing any dive operations involving Class 3B or Class 4 lasers. The Laser Type, Laser Class, Wavelength, and Maximum Output Wattage for each laser in use shall be stated on the approved dive plan.
- b) Determination of appropriate eye protection shall be in accordance with Standards promulgated in ANSI Z136.
- c) Only divers wearing appropriate eye protection for the laser wavelengths being used will be allowed in the water.
- d) All laser eyewear shall be clearly labeled with the Optical Density and the Wavelength for which protection is afforded.
 - 1. If custom made, Optical Density and Wavelength information provided by the manufacturer must be etched permanently on the laser eye protection shield.
- e) Laser eye shields must be fitted externally to the flat viewing pane of diving masks and sealed in such a way as to prevent any accidental penetration through the mask lens.
- f) Laser protection eyewear shall be inspected for damage or wear prior to commencing dive operations.
- g) All potentially reflective surfaces on dive equipment should be covered in such a way as to minimize the possibility of reflected beam emissions.
- h) Divers in the water with an operating class 4 laser device should not place any part of their body in the laser beam.
- i) No deployment of lasers may occur if unauthorized divers are present. Laser deployment must cease immediately if unauthorized divers enter the water at any time. Unauthorized divers include any divers under the auspices of FAU who have not been properly trained, briefed, and listed on the approved dive plan per the requirements above, or any non-FAU diver who may be present at or subsequently enter the area of intended laser use.

Hand-held Lasers

Hand-held, commercially available laser devices such as underwater laser pointers and range finders must be used in accordance with all Manufacturers specifications, instructions and warnings, and applicable training requirements in section 11.70 a) above.

- a) The Lead Diver must be notified prior to all dive briefings if a handheld laser will be deployed by any dive team member.

SECTION 12.0 REBREATHERS

This section defines specific considerations regarding the following issues for the use of rebreathers:

- Training and/or experience verification requirements for authorization
- Equipment requirements
- Operational requirements and additional safety protocols to be used

Application of this standard is in addition to pertinent requirements of all other sections of the FAU Standards for Scientific Diving.

For rebreather dives that also involve staged decompression and/or mixed gas diving, all requirements for each of the relevant diving modes shall be met. The Diving and Boating Safety Committee reserves the authority to review each application of all specialized diving modes, and include any further requirements deemed necessary beyond those listed here on a case-by-case basis.

No diver shall conduct planned operations using rebreathers without prior review and approval of the DBSC.

In all cases, trainers shall be qualified for the type of instruction to be provided. Training shall be conducted by agencies or instructors approved by the DSO and DBSC.

12.10 Definitions and General Information

- a) Rebreathers are defined as any device that recycles some or all of the exhaled gas in the breathing loop and returns it to the diver. Rebreathers maintain levels of oxygen and carbon dioxide that support life by metered injection of oxygen and chemical removal of carbon dioxide. These characteristics fundamentally distinguish rebreathers from open-circuit life support systems, in that the breathing gas composition is dynamic rather than fixed.
 1. Advantages of rebreathers may include increased gas utilization efficiencies that are often independent of depth, extended no-decompression bottom times and greater decompression efficiency, and reduction or elimination of exhaust bubbles that may disturb aquatic life or sensitive environments.
 2. Disadvantages of rebreathers include high cost and, in some cases, a high degree of system complexity and reliance on instrumentation for gas composition control and monitoring, which may fail. The diver is more likely to experience hazardous levels of hypoxia, hyperoxia, or hypercapnia, due to user error or equipment malfunction, conditions which may lead to underwater blackout and drowning. Inadvertent flooding of the breathing loop and wetting of the carbon dioxide absorbent may expose the diver to ingestion of an alkaline slurry ("caustic cocktail").
 3. An increased level of discipline and attention to rebreather system status by the diver is required for safe operation, with a greater need for self-reliance. Rebreather system design and operation varies significantly between make and model. For these reasons when evaluating any dive plan incorporating rebreathers, risk-management emphasis should be placed on the individual qualifications of

the diver on the specific rebreather make and model to be used, in addition to specific equipment requirements and associated operational protocols.

- b) Oxygen Rebreathers - Oxygen rebreathers recycle breathing gas, consisting of pure oxygen, replenishing the oxygen metabolized by the diver. Oxygen rebreathers are generally the least complicated design, but are normally limited to a maximum operation depth of 20fsw due to the risk of unsafe hyperoxic exposure.
- c) Semi-Closed Circuit Rebreathers - Semi-closed circuit rebreathers (SCR) recycle the majority of exhaled breathing gas, venting a portion into the water and replenishing it with a constant or variable amount of a single oxygen-enriched gas mixture. Gas addition and venting is balanced against diver metabolism to maintain safe oxygen levels by means which differ between SCR models, but the mechanism usually provides a semi-constant fraction of oxygen (FO_2) in the breathing loop at all depths, similar to open-circuit SCUBA.
- d) Closed-Circuit Mixed Gas Rebreathers - Closed-circuit mixed gas rebreathers (CCR) recycle all of the exhaled gas and replace metabolized oxygen via an electronically controlled valve, governed by electronic oxygen sensors. Manual oxygen addition is available as a diver override, in case of electronic system failure. A separate inert gas source (diluent), usually containing primarily air, heliox, or trimix, is used to maintain oxygen levels at safe levels when diving below 20fsw. CCR systems operate to maintain a constant oxygen partial pressure (PPO_2) during the dive, regardless of depth.

12.20 Prerequisites

Specific training requirements for use of each rebreather model shall be defined by DBSC on a case-by-case basis. Training shall include factory-recommended requirements, but may exceed this to prepare for the type of mission intended (e.g., staged decompression or heliox/trimix CCR diving).

Training Prerequisites

- a) Active scientific diver status, with depth qualification sufficient for the type, makes, and model of rebreather, and planned application.
- b) Completion of a minimum of 50 open-water dives on SCUBA.
- c) For SCR or CCR, a minimum 100-fsw-depth qualification is generally recommended, to ensure the diver is sufficiently conversant with the complications of deeper diving. If the sole expected application for use of rebreathers is shallower than this, a lesser depth qualification may be allowed with the approval of the DBSC.
- d) Nitrox training. Training in use of nitrox mixtures containing 25% to 40% oxygen is required. Training in use of mixtures containing 40% to 100% oxygen may be required, as needed for the planned application and rebreather system. Training may be provided as part of rebreather training.

Training

Successful completion of the following training program qualifies the diver for rebreather diving using the system on which the diver has been trained, in depths of 130fsw and shallower, for dives that do not require decompression stops, using nitrogen/oxygen breathing media.

- a) Satisfactory completion of a rebreather training program authorized or recommended by the manufacturer of the rebreather to be used, or other training approved by the DCB. Successful completion of training does not in itself authorize the diver to use rebreathers. The diver must demonstrate to the DBSC or its designee that the diver possesses the proper attitude, judgment, and discipline to safely conduct rebreather diving in the context of planned operations.
- b) Classroom training shall include:
 1. A review of those topics of diving physics and physiology, decompression management, and dive planning included in prior scientific diver, nitrox, staged decompression and/or mixed gas training, as they pertain to the safe operation of the selected rebreather system and planned diving application.
 2. In particular, causes, signs and symptoms, first aid, treatment and prevention of the following must be covered:
 - Hyperoxia (CNS and Pulmonary Oxygen Toxicity)
 - Middle Ear Oxygen Absorption Syndrome (oxygen ear)
 - Hyperoxia-induced myopia
 - Hypoxia
 - Hypercapnia
 - Inert gas narcosis
 - Decompression sickness
 3. Rebreather-specific information required for the safe and effective operation of the system to be used, including:
 - System design and operation, including:
 - Counterlung(s)
 - CO₂ scrubber
 - CO₂ absorbent material types, activity characteristics, storage, handling and disposal
 - Oxygen control system design, automatic and manual
 - Diluent control system, automatic and manual (if any)
 - Pre-dive set-up and testing
 - Post-dive break-down and maintenance
 - Oxygen exposure management
 - Decompression management and applicable decompression tracking methods
 - Dive operations planning

Problem recognition and management, including system failures leading to hypoxia, hyperoxia, hypercapnia, flooded loop, and caustic cocktail

Emergency protocols and bailout procedures

Practical Training (with model of rebreather to be used)

- a) A minimum number of hours of underwater time.

Type	Pool/Confined Water	O/W Training	O/W Supervised
Oxygen Rebreather	1 dive, 90 min	4 dives, 120 min.*	2 dives, 60 min
Semi-Closed Circuit	1 dive, 90-120 min	4 dives, 120 min.**	4 dives, 120 min
Closed-Circuit	1 dive, 90-120 min	8 dives, 380 min.***	4 dives, 240 min

* Dives should not exceed 20 fsw.
 ** First two dives should not exceed 60 fsw. Subsequent dives should be at progressively greater depths, with at least one dive in the 80 to 100 fsw range.
 *** Total underwater time (pool and open water) of approximately 500 minutes. First two open water dives should not exceed 60 fsw. Subsequent dives should be at progressively greater depths, with at least 2 dives in the 100 to 130 fsw range.

- b) Amount of required in-water time should increase proportionally to the complexity of rebreather system used.
- c) Training shall be in accordance with the manufacturer's recommendations.

Practical Evaluations

Upon completion of practical training, the diver must demonstrate to the DBSC or its designee proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used. Skills shall include, at a minimum:

- Oxygen control system calibration and operation checks
- Carbon dioxide absorbent canister packing
- Supply gas cylinder analysis and pressure check
- Test of one-way valves
- System assembly and breathing loop leak testing
- Pre-dive breathing to test system operation
- In-water leak checks
- Buoyancy control during descent, bottom operations, and ascent
- System monitoring and control during descent, bottom operations, and ascent
- Proper interpretation and operation of system instrumentation (PO2 displays, dive computers, gas supply pressure gauges, alarms, etc, as applicable)
- Unit removal and replacement on the surface.
- Bailout and emergency procedures for self and buddy, including:
- System malfunction recognition and solution
- Manual system control

- Flooded breathing loop recovery (if possible)
- Absorbent canister failure
- Alternate bailout options
- Symptom recognition and emergency procedures for hyperoxia, hypoxia, and hypercapnia
- Proper system maintenance, including:
- Full breathing loop disassembly and cleaning (mouthpiece, check-valves, hoses, counterlung, absorbent canister, etc.)
- Oxygen sensor replacement (for SCR and CCR)
- Other tasks required by specific rebreather models

Written Evaluation

A written evaluation approved by the DBSC with a pre-determined passing score, covering concepts of both classroom and practical training, is required.

Supervised Rebreather Dives

Upon successful completion of open water training dives, the diver is authorized to conduct a series of supervised rebreather dives, during which the diver gains additional experience and proficiency.

- Supervisor for these dives should be the DSO or designee, and should be an active scientific diver experienced in diving with the make/model of rebreather being used.
- Dives at this level may be targeted to activities associated with the planned science diving application. See the following table for number and cumulative water time for different rebreather types.

Type	Pool/Confined Water	O/W Training	O/W Supervised
Oxygen Rebreather	1 dive, 90 min	4 dives, 120 min.*	2 dives, 60 min
Semi-Closed Circuit	1 dive, 90-120 min	4 dives, 120 min.**	4 dives, 120 min
Closed-Circuit	1 dive, 90-120 min	8 dives, 380 min.***	4 dives, 240 min
<p>* Dives should not exceed 20 fsw. ** First two dives should not exceed 60 fsw. Subsequent dives should be at progressively greater depths, with at least one dive in the 80 to 100 fsw range. *** Total underwater time (pool and open water) of approximately 500 minutes. First two open water dives should not exceed 60 fsw. Subsequent dives should be at progressively greater depths, with at least 2 dives in the 100 to 130 fsw range.</p>			

- Maximum ratio of divers per designated dive supervisor is 4:1. The supervisor may dive as part of the planned operations.

Extended Range, Required Decompression and Helium-Based Inert Gas

Rebreather dives involving operational depths in excess of 130 fsw, requiring staged decompression, or using diluents containing inert gases other than nitrogen are subject to additional training requirements, as determined by DBSC on a case-by-case basis. Prior experience with required decompression and mixed gas diving using open-circuit SCUBA is desirable, but is not sufficient for transfer to dives using rebreathers without additional training.

- a) As a prerequisite for training in staged decompression using rebreathers, the diver shall have logged a minimum of 25 hours of underwater time on the rebreather system to be used, with at least 10 rebreather dives in the 100 fsw to 130 fsw ranges.
- b) As a prerequisite for training for use of rebreathers with gas mixtures containing inert gas other than nitrogen, the diver shall have logged a minimum of 50 hours of underwater time on the rebreather system to be used and shall have completed training in stage decompression methods using rebreathers. The diver shall have completed at least 12 dives requiring staged decompression on the rebreather model to be used, with at least 4 dives near 130 fsw.
- c) Training shall be in accordance with standards for required-decompression and mixed gas diving, as applicable to rebreather systems, starting at the 130 fsw level.

Maintenance of Proficiency

- a) To maintain authorization to dive with rebreathers, an authorized diver shall make at least one dive using a rebreather every 8 weeks. For divers authorized for the conduct of extended range, stage decompression or mixed-gas diving, at least one dive per month should be made to a depth near 130 fsw, practicing decompression protocols.
- b) For a diver in arrears, the DBSC shall approve a program of remedial knowledge and skill tune-up training and a course of dives required to return the diver to full authorization. The extent of this program should be directly related to the complexity of the planned rebreather diving operations.

12.30 Equipment Requirements

General Requirements

- a) Only those models of rebreathers specifically approved by DBSC shall be used.
- b) Rebreathers should be manufactured according to acceptable Quality Control/Quality Assurance protocols, as evidenced by compliance with the essential elements of ISO 9004. Manufacturers should be able to provide to the DBSC supporting documentation to this effect.
- c) Unit performance specifications should be within acceptable levels as defined by standards of a recognized authority (CE, US Navy, Royal Navy, NOAA, etc...).
- d) Prior to approval, the manufacturer should supply the DBSC with supporting documentation detailing the methods of specification determination by a recognized third-party testing agency, including unmanned and manned testing. Test data should be from a recognized, independent test facility.
- e) The following documentation for each rebreather model to be used should be available as a set of manufacturer's specifications. These should include:
 - Operational depth range

- Operational temperature range
 - Breathing gas mixtures that may be used
 - Maximum exercise level which can be supported as a function of breathing gas and depth
 - Breathing gas supply durations as a function of exercise level and depth
 - CO₂ absorbent durations, as a function of depth, exercise level, breathing gas, and water temperature
 - Method, range and precision of inspired PPO₂ control, as a function of depth, exercise level, breathing gas, and temperature
 - Likely failure modes and backup or redundant systems designed to protect the diver if such failures occur
 - Accuracy and precision of all readouts and sensors
 - Battery duration as a function of depth and temperature
 - Mean time between failures of each subsystem and method of determination
- f) A complete instruction manual is required, fully describing the operation of all rebreather components and subsystems as well as maintenance procedures.
- g) A maintenance log is required. The unit maintenance shall be up-to-date based upon manufacturer's recommendations.

Minimum Equipment

- a) A surface/dive valve in the mouthpiece assembly, allowing sealing of the breathing loop from the external environment when not in use.
- b) An automatic gas addition valve, so that manual volumetric compensation during descent is unnecessary.
- c) Manual gas addition valves, so that manual volumetric compensation during descent and manual oxygen addition at all times during the dive are possible.
- d) The diver shall carry alternate life support capability (open-circuit bail-out or redundant rebreather) sufficient to allow the solution of minor problems and allow reliable access to a pre-planned alternate life support system.

Oxygen Rebreathers

Oxygen rebreathers shall be equipped with manual and automatic gas addition valves.

Semi-Closed Circuit Rebreathers

SCR's shall be equipped with at least one manufacturer-approved oxygen sensor sufficient to warn the diver of impending hypoxia. Sensor redundancy is desirable, but not required.

Closed Circuit Mixed-gas Rebreathers

- a) CCR shall incorporate a minimum of three independent oxygen sensors.
- b) A minimum of two independent displays of oxygen sensor readings shall be available to the diver.
- c) Two independent power supplies in the rebreather design are desirable. If only one is present, a secondary system to monitor oxygen levels without power from the primary battery must be incorporated.
- d) CCR shall be equipped with manual diluent and oxygen addition valves, to enable the diver to maintain safe oxygen levels in the event of failure of the primary power supply or automatic gas addition systems.
- e) Redundancies in onboard electronics, power supplies, and life support systems are highly desirable.

12.40 Operational Requirements

General Requirements

- a) All dives involving rebreathers must comply with applicable operational requirements for open-circuit SCUBA dive's to equivalent depths.
- b) No rebreather system should be used in situations beyond the manufacturer's stated design limits (dive depth, duration, water temperature, etc).
- c) Modifications to rebreather systems shall be in compliance with manufacturer's recommendations.
- d) Rebreather maintenance is to be in compliance with manufacturer's recommendations including sanitizing, replacement of consumables (sensors, CO₂ absorbent, gas, batteries, etc) and periodic maintenance.
- e) Dive Plan. In addition to standard dive plan components stipulated in AAUS Section 2.0, all dive plans that include the use of rebreathers must include, at minimum, the following details:
 - Information about the specific rebreather model to be used
 - Make, model, and type of rebreather system
 - Type of CO₂ absorbent material
 - Composition and volume(s) of supply gases
 - Complete description of alternate bailout procedures to be employed, including manual rebreather operation and open-circuit procedures
 - Other specific details as requested by DBSC

Buddy Qualifications

- a) A diver whose buddy is diving with a rebreather shall be trained in basic rebreather operation, hazard identification, and assist/rescue procedures for a rebreather diver.
- b) If the buddy of a rebreather diver is using open-circuit scuba, the rebreather diver must be equipped with a means to provide the open-circuit scuba diver with a sufficient supply of open-circuit breathing gas to allow both divers to return safely to the surface.

Oxygen Exposures

- a) Planned oxygen partial pressure in the breathing gas shall not exceed 1.4 atmospheres at depths greater than 30 feet.
- b) Planned oxygen partial pressure set point for CCR shall not exceed 1.4 atm. Set point at depth should be reduced to manage oxygen toxicity according to the NOAA Oxygen Exposure Limits.
- c) Oxygen exposures should not exceed the NOAA oxygen single and daily exposure limits. Both CNS and pulmonary (whole-body) oxygen exposure indices should be tracked for each diver.

Decompression Management

- a) DBSC shall review and approve the method of decompression management selected for a given diving application and project.
- b) Decompression management can be safely achieved by a variety of methods, depending on the type and model of rebreather to be used. Following is a general list of methods for different rebreather types:
 1. Oxygen rebreathers: Not applicable.
 2. SCR (presumed constant FO₂):
 - Use of any method approved for open-circuit scuba diving breathing air, above the maximum operational depth of the supply gas.
 - Use of open-circuit nitrox dive tables based upon expected inspired FO₂. In this case, contingency air dive tables may be necessary for active-addition SCR's in the event that exertion level is higher than expected.
 - Equivalent air depth correction to open-circuit air dive tables, based upon expected inspired FO₂ for planned exertion level, gas supply rate, and gas composition. In this case, contingency air dive tables may be necessary for active-addition SCR's in the event that exertion level is higher than expected.
 3. CCR (constant PPO₂):
 - Integrated constant PPO₂ dive computer.
 - Non-integrated constant PPO₂ dive computer.
 - Constant PPO₂ dive tables.
 - Open-circuit (constant FO₂) nitrox dive computer, set to inspired FO₂ predicted using PPO₂ set point at the maximum planned dive depth.
 - Equivalent air depth (EAD) correction to standard open-circuit air dive tables, based on the inspired FO₂ predicted using the PPO₂ set point at the maximum planned dive depth.
 - Air dive computer, or air dive tables used above the maximum operating depth (MOD) of air for the PPO₂ set point selected.

Maintenance Logs, CO2 Scrubber Logs, Battery Logs, and Pre-And Post-Dive Checklists

Logs and checklists will be developed for the rebreather used, and will be used before and after every dive. Diver shall indicate by initialing that checklists have been completed before and after each dive. Such documents shall be filed and maintained as permanent project records. No

rebreather shall be dived which has failed any portion of the pre-dive check, or is found to not be operating in accordance with manufacturer's specifications. Pre-dive checks shall include:

- Gas supply cylinders full
- Composition of all supply and bail-out gases analyzed and documented
- Oxygen sensors calibrated
- Carbon dioxide canister properly packed
- Remaining duration of canister life verified
- Breathing loop assembled
- Positive and negative pressure leak checks
- Automatic volume addition system working
- Automatic oxygen addition systems working
- Pre-breathe system for 3 minutes (5 minutes in cold water) to ensure proper oxygen addition and carbon dioxide removal (be alert for signs of hypoxia or hypercapnia)
- Other procedures specific to the model of rebreather used
- Documentation of ALL components assembled
- Complete pre-dive system check performed
- Final operational verification immediately before to entering the water:
- PO₂ in the rebreather is not hypoxic
- Oxygen addition system is functioning;
- Volumetric addition is functioning
- Bail-out life support is functioning

Alternate Life Support System

The diver shall have reliable access to an alternate life support system designed to safely return the diver to the surface at normal ascent rates, including any required decompression in the event of primary rebreather failure. The complexity and extent of such systems are directly related to the depth/time profiles of the mission. Examples of such systems include, but are not limited to:

- a) Open-circuit bailout cylinders or sets of cylinders, either carried or pre-positioned
- b) Redundant rebreather
- c) Pre-positioned life support equipment with topside support

CO₂ Absorbent Material

- a) CO₂ absorption canister shall be filled in accordance with the manufacturer's specifications.
- b) CO₂ absorbent material shall be used in accordance with the manufacturer's specifications for expected duration.
- c) If CO₂ absorbent canister is not exhausted and storage between dives is planned, the canister should be removed from the unit and stored sealed and protected from ambient air, to ensure the absorbent retains its activity for subsequent dives.
- d) Long-term storage of carbon dioxide absorbents shall be in a cool, dry location in a sealed container. Field storage must be adequate to maintain viability of material until use.

Consumables (e.g., batteries, oxygen sensors, etc.)

Other consumables (e.g., batteries, oxygen sensors, etc.) shall be maintained, tested, and replaced in accordance with the manufacturer's specifications.

Unit Disinfections

The entire breathing loop, including mouthpiece, hoses, counterlungs, and CO₂ canister, should be disinfected periodically according to manufacturer's specifications. The loop must be disinfected between each use of the same rebreather by different divers.

12.50 Oxygen Rebreathers

- a) Oxygen rebreathers shall not be used at depths greater than 20 feet.
- b) Breathing loop and diver's lungs must be adequately flushed with pure oxygen prior to entering the water on each dive. Once done, the diver must breathe continuously and solely from the intact loop, or re-flushing is required.
- c) Breathing loop shall be flushed with fresh oxygen prior to ascending to avoid hypoxia due to inert gas in the loop.

12.60 Semi-Closed Circuit Rebreathers

- a) The composition of the injection gas supply of a semi-closed rebreather shall be chosen such that the partial pressure of oxygen in the breathing loop will not drop below 0.2 atm, even at maximum exertion at the surface.
- b) The gas addition rate of active addition SCR (e.g., Draeger Dolphin and similar units) shall be checked before every dive, to ensure it is balanced against expected workload and supply gas FO₂.
- c) The intermediate pressure of supply gas delivery in active-addition SCR shall be checked periodically, in compliance with manufacturer's recommendations.
- d) Maximum operating depth shall be based upon the FO₂ in the active supply cylinder.
- e) Prior to ascent to the surface the diver shall flush the breathing loop with fresh gas or switch to an open-circuit system to avoid hypoxia. The flush should be at a depth of approximately 30 fsw during ascent on dives deeper than 30 fsw, and at bottom depth on dives 30 fsw and shallower.

12.70 Closed-Circuit Rebreathers

- a) The FO₂ of each diluent gas supply used shall be chosen so that, if breathed directly while in the depth range for which its use is intended, it will produce an inspired PPO₂ greater than 0.20 atm but no greater than 1.4 atm.
- b) Maximum operating depth shall be based on the FO₂ of the diluent in use during each phase of the dive, so as not to exceed a PO₂ limit of 1.4 atm.
- c) Divers shall monitor both primary and secondary oxygen display systems at regular intervals throughout the dive, to verify that readings are within limits, that redundant displays are providing similar values, and whether readings are dynamic or static (as an indicator of sensor failure).
- d) The PPO₂ set point shall not be lower than 0.4 atm or higher than 1.4 atm.

SECTION 13.00 SCIENTIFIC CAVE AND CAVERN DIVING

This standard helps to ensure all scientific diving in cave or cavern environments is conducted in a manner which will maximize the protection of scientific divers from accidental injury and/or illness and provide the basis allowing the working reciprocity between AAUS organizational members.

If a conflict exists between this standard and other standards in this manual, the information set forth in this standard only takes precedence when the scientific diving being conducted takes place wholly or partly within an underwater cave or cavern environment.

A dive team shall be considered to be cave or cavern diving if at any time during the dive they find themselves in a position where they cannot complete a direct, unobstructed ascent to the surface because of rock formations.

The member organization requires that no person shall engage in scientific cave or cavern diving unless that person holds a recognized certificate/authorization issued pursuant to the provisions of this manual.

The diver must demonstrate to the DBSC or its designee that the diver possesses the proper attitude, judgment, and discipline to safely conduct cave and cavern diving in the context of planned operations.

Operational requirements for cave and cavern diving have been established through accident analysis of previous cave diving accidents.

13.1 Definitions

Alternate Gas Supply - Fully redundant system capable of providing a gas source to the diver should their primary gas supply fail.

Bubble Check - Visual examination by the dive team of their diving systems, looking for o-ring leaks or other air leaks conducted in the water prior to entering a cave. Usually included in the "S" Drill.

Cave – A dive shall be considered a cave dive if any one or more of the environmental limits specified in the definition of cavern are exceeded or otherwise not followed. Linear penetrations limits shall not exceed the limits of each diver's training.

Cave Dive - A dive, which takes place partially or wholly underground, in which one or more of the environmental parameters defining a cavern dive are exceeded.

Cavern - An entrance and first chamber to a cave where:

1. Sunlight from the entrance is visible to all dive team members at all times during the dive.
2. Members of the dive team do not pass through any restrictions that don't allow the divers to swim side by side during the dive, nor are there any restrictions between the divers and the most expeditious exit to the surface.
3. Maximum depth achieved shall not exceed the depth ratings of dive team.

Cavern Dive - A dive which takes place partially or wholly underground, in which the following

environmental parameters are met:

1. Natural sunlight is continuously visible from the entrance.
2. Environmental conditions will be evaluated by the DSO or designee and appropriate limits incorporated into the dive plan.

Dual Valve Manifold with Isolator Valve - A manifold joining two diving cylinders, that allows the use of two completely independent regulators. If either regulator fails, it may be shut off, allowing the remaining regulator access to the gas in both of the diving cylinders.

Gas Management - Gas planning rule which is used in cave diving environments in which the diver reserves a portion of their available breathing gas for anticipated emergencies (See Rule of Thirds, Sixths).

Guideline - Continuous line used as a navigational reference during a dive leading from the team position to a point where a direct vertical ascent may be made to the surface.

Jump/Gap Reel-Spool or reel used to connect one guide line to another thus ensuring a continuous line to the exit.

Knife/Line Cutter - Small, sharp blade capable of easily cutting a guideline and that is accessible to the diver.

Lava Tube - Type of cave or cavern formed by the surface hardening of a stream of flowing molten rock, which may later become flooded due to static sea level changes.

Line Marker - Any one of several types of markers attached to a guideline, which provides additional navigational information to the dive team, most commonly the direction out to the nearest surface.

Mine Diving - Diving in the flooded portions of a man-made mine. Necessitates use of techniques detailed for cave diving.

Penetration Distance - Linear distance from the entrance intended or reached by a dive team during a dive at a dive site.

Primary Reel - Initial guideline used by the dive team from open water to maximum penetration or a permanently installed guideline.

Restriction - Any passage through which two divers cannot easily pass side by side while sharing air.

Rule of Thirds - Gas planning rule which is used in cave diving environments in which the diver reserves 2/3's of their breathing gas supply for exiting the cave or cavern.

Rule of Sixths - Air planning rule which is used in cave or other confined diving environments in which the diver reserves 5/6's of their breathing gas supply (for DPV use, siphon diving, etc.) for exiting the cave or cavern.

Safety Drill - ("S" Drill) - Short gas sharing, equipment evaluation, dive plan, and communication exercise carried out prior to entering a cave or cavern dive by the dive team.

Safety Reel - Secondary reel used as a backup to the primary reel, usually containing 150 feet of guideline that is used in an emergency.

Scientific Cave or Cavern Diver In Training - Authorized to dive in the cave or cavern environment under the direct supervision of qualified instructional personnel for training purposes only.

Scientific Cavern Diver - Authorization to dive in an overhead environment as defined in cavern.

Scientific Cave Diver - Authorization to dive in an overhead environment as defined in cave.

Sidemount Diving - A diving mode utilizing two independent SCUBA systems carried along the sides of the diver's body; either of which always has sufficient air to allow the diver to reach the surface unassisted.

Siphon - Cave into which water flows with a generally continuous in-current.

Solution Cave - Cave formed in carbonate or carbonate-cemented bedrock, formed by the dissolution of the rock by groundwater.

Spring - Cave with water flowing with a generally continuous outflow.

Sump - An area in a dry cave that can no longer be negotiated without the use of diving equipment.

Well - A vertical or nearly vertical shaft, usually manmade, through which a diver can access a dive site.

13.2 Cave and Cavern Environment Hazards

Current/Flow - Underwater caves have currents that vary in strength and direction. Of particular note is a condition known as siphoning. Siphoning caves have flow or current directed into the cave. This can cause poor visibility as a result of mud and silt being drawn into the cave entrance.

Silt - The presences of silt, sand, mud, clay, etc. on the cave floor can cause visibility to be reduced to nothing in a very short time.

Restrictions - Any passage through which two divers cannot easily pass side by side while sharing air make air sharing difficult.

Cave-ins - Cave-ins are a normal part of cave evolution; however experiencing a cave-in during diving operations is extremely unlikely.

13.3 Minimum Experience and Training Requirements

a) Cavern Diver

1. Prerequisites

The applicant for training shall have met the requirements in Section 5.00 of the *AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs*, fourth edition (2003), and hold as a minimum a scientific diver permit.

2. Cavern Training

The applicant is to participate in the following areas of training, or their equivalent:

- Classroom Lecture and Critique—The applicant shall participate in classroom discussion or equivalent type activities covering these topics: Policy for cavern diving, cavern environment and environmental hazards, accident analysis, psychological considerations, equipment, body control, communications, cavern diving techniques, navigation and guidelines, dive planning, cave geology, cave hydrology, cave biology, and emergency procedures.
- Land Drills—The applicant shall participate in drills above water using the guideline and reel. Drills are to emphasize proper use of the reel, techniques and considerations for laying a guideline, guideline following, buddy communication, and emergency procedures.
- Cavern Dives—A minimum of four (4) cavern dives, preferably to be conducted in a minimum of two (2) different caverns. Skills the applicant should demonstrate include: Safety drill (S-drill), gear matching, bubble check prior to entering the cavern on each dive, proper buoyancy compensator use, proper trim and body positioning, hovering and buoyancy with hand tasks, specialized propulsion techniques (modified flutter kick, modified frog kick, pull and glide, ceiling walk or shuffle), proper guideline and reel use, ability to follow the guideline with no visibility, sharing air while following a guideline, and sharing air while following the guideline with no visibility light and hand signal use, and ability to comfortably work in a cavern without assistance.
- Written Examination - A written evaluation approved by the DBSC with a predetermined passing score, covering concepts of both classroom and practical training is required.

b) Cave Diver

1. Prerequisites

The applicant for training shall hold as a minimum a cavern diver permit.

2. Cave Training

The applicant is to participate in the following areas of training, or their equivalent:

Classroom Lecture and Critique—The applicant shall participate in classroom discussion or equivalent type activities covering these topics: Review of the topics listed in cavern diver training and differing techniques and procedures used in cave diving, additional equipment procedures used in cave diving, cave diving equipment configurations, procedures for conducting diving operations involving complex navigation and use of line markers, advanced gas management and a thorough review of dive tables, decompression tables, and decompression theory.

- Land Drills—The applicant shall participate in drills above water included in cavern training. Drills are to emphasize proper use of the reel in lost diver procedures, as well as line placements and station location as required for surveying.
- Cave Dives—A minimum of twelve (12) cave dives, to be conducted in a minimum of four (4) different cave sites with differing conditions recommended. Skills the applicant should demonstrate include: Review of skills listed in cavern training, and special techniques in buoyancy control, referencing and back-up navigation, air sharing in a minor restriction using a single file method, special propulsion techniques in heavy outflow, anti-silting techniques, line jumping techniques and protocols, surveying, and ability to critique their dives. Emergency procedures training shall include proficiency in lost line, lost diver, gas sharing, light failure, valve manipulation, and no/low visibility situations.
- Written Examination - A written evaluation approved by the DBSC with a predetermined passing score, covering concepts of both classroom and practical training is required.

13.4 Equipment Requirements

Equipment used for SCUBA in cave or cavern diving is based on the concept of redundancy. Redundant SCUBA equipment shall be carried whenever the planned penetration distances are such that an emergency swimming ascent is not theoretically possible.

a) Cavern Diving Equipment

The following equipment shall be required, in excess of that detailed for open water SCUBA diving in Volume 1, Section 3.00. Each member of the dive team shall have:

- At minimum, a single tank equipped with an “H” valve or an alternate air supply.
- A BCD capable of being inflated from the tank.
- Slate and pencil.
- Two battery powered secondary lights of an approved type.
- Knife or line cutter.
- One primary reel of at least 350 feet for each team.
- Snorkel—No snorkel shall be worn while inside underwater cave or cavern.

b) Cave Diving Equipment

The following equipment shall be required, in excess of that detailed for cavern diving: Each member of the dive team shall have:

- Cylinders with dual orifice isolation valve manifold or independent SCUBA systems each capable of maintaining enough gas for the diver during exit and ascent to the surface.
- Two completely independent regulators, at least one of each having submersible tank pressure gauge, a five foot or longer second stage hose, low pressure inflator for the BCD.
- A primary light with sufficient burn time for the planned dive.
- Safety reel with at least 150 feet of line.
- Appropriate submersible dive tables and/or dive computer (computers w/ backup tables).
- Line markers.
- Snorkel—No snorkel shall be worn while inside underwater cave or cavern.

13.5 Operational Requirements and Safety Protocols

All members of the dive team must have met all applicable sections of Volume One and applicable sections of Volume Two of the AAUS manual and be authorized for that type of diving by the DBSC before conducting scientific cave dives.

a) Cavern Diver Procedures

- Cavern diving shall not be conducted at depths greater than 100 feet.
- Dive teams shall perform a safety drill prior to each cave or cavern penetration that includes equipment check, gas management, and dive objectives.
- Each team within the cavern zone must utilize a continuous guideline appropriate for the environment leading to a point from which an uninterrupted ascent to the surface may be made.
- Gas management must be appropriate for the planned dive with special considerations made for; DPV's, siphon diving, rebreathers, etc.
- The entire dive team is to immediately terminate the dive whenever any dive team member feels an unsafe condition is present.

b) Cave Diving Procedures

- Dive teams shall perform a safety drill prior to each cave or cavern penetration that includes equipment check, gas management, and dive objectives.
- Diver teams must run or follow a continuous guideline from the surface pool to maximum penetration.
- Gas management must be appropriate for the planned dive with special considerations made for: DPV's, siphon diving, rebreathers, etc.
- Each diver must carry one primary and two back up lights.
- Divers utilizing side mount diving or other dual independent diving systems must have the approval of the Diving Safety Officer or designee.
- The entire dive team is to immediately terminate the dive whenever any dive team member feels an unsafe condition is present.

SECTION 14.00 SNORKELING OR SWIMMING

Florida Atlantic University Standards for Snorkelers

Snorkeling and swimming activities pose a risk of injury to personnel who use these methods to conduct scientific research tasks. Personnel conducting these activities in support of research or academic activities must adhere to the following standards and procedures.

14.10 Definitions

Snorkeler - Any person who is wholly or partially submerged in the water and is equipped with a face plate (face mask or swim goggles) with or without swim fins or snorkel.

Swimmer - Any person wholly or partially submerged in water without a face plate (face mask or swim goggles) but may be using other types of swim aids such as fins.

14.20 General Guidelines

Any snorkeler or swimmer on FAU projects, diving from FAU vessels or small boats, or using FAU diving equipment shall follow the standards outlined below:

- a) Snorkelers and swimmers must possess adequate swimming skills to participate in such activities under FAU auspices.
- b) Personnel who only snorkel/swim are not required to have the same physical evaluation and training as SCUBA divers; however, they must complete and submit an application (Appendix C), a waiver (Appendix B) and maintain a current CPR/First Aid certification.

Exceptions:

- 1) FAU employees may, in lieu of a signed waiver, provide proof through Human Resources of current employment status.
- c) Snorkelers should notify (indicating who, where, and when) their supervisor, principal investigator, or Division Director prior to the snorkeling trip.
- d) The person responsible for a snorkeling or swimming trip shall submit an FAU Dive Plan Form (Appendix E.) to the DSO. Complete all sections except "Dive Profiles."
- e) If a boat is used, the person responsible for the snorkeling or swimming trip shall also complete and submit an FAU Float Plan (Appendix D.) to the DSO, and appropriate tag lines shall be attached to the boat while snorkeling or swimming operations are under way.
- f) Individuals must comply with the "buddy system" while snorkeling or swimming. Solo snorkeling or swimming is prohibited.
- g) Individuals must use a Buoyancy Compensator (BC), inflatable vest, or other personal flotation device when snorkeling or swimming in waters greater than chest deep or where the possibility of rip currents exists.

- h) A divers-down flag shall be displayed as specified in Section 3.40 of this manual whether snorkeling or swimming is initiated from a boat or the shore. Snorkelers must adhere to State of Florida regulations (see below).
- i) Snorkelers must use good judgment in deciding whether a planned snorkel dive is safe.
- j) Snorkelers must evaluate conditions before and throughout the dive; for example, current, tides, underwater hazards (glass, oyster shells, fish hooks), boat traffic, fishing lines, lightning, etc.

14.30 Regulations for Classes or Field Trips Involving Snorkeling

Any class taught through the auspices of FAU, or using FAU facilities or boats must adhere to the following regulations in addition to those listed above:

- a) Any class involving snorkeling must provide a Snorkel Supervisor who is trained in rescue techniques, including swim rescue, CPR and First Aid.
- b) The Snorkel Supervisor shall file a dive plan (listing who, where, and when) with the FAU Diving Safety Officer prior to the snorkeling trip.
- c) Each snorkeler must complete all necessary forms (Page 1 of Appendix C: Application to the Scientific Diving Program) prior to snorkeling and submit to the Snorkel Supervisor.
- d) Safety equipment, including a First Aid kit, must be available at the dive site.
- e) Additional emergency equipment such as rescue floats, tag lines for currents, and radio or cellular phone may be required depending on the site and conditions.
- f) Prior to snorkeling trips where conditions may involve snorkeling in the ocean, in deep water (over waist or chest deep), or in currents, the Snorkel Supervisor should conduct a checkout snorkel and swim evaluation of each snorkeler in shallow, confined water.

14.40 State of Florida Regulations for Snorkelers

- a) The state considers snorkelers to be "divers" and requires them to fly a "divers-down" flag a minimum of 3 feet above the surface of the water within 100 feet of the snorkelers.
- b) Snorkelers cannot stand on or touch coral within state or federal waters.
- c) Snorkeling is not allowed in marked channels (e.g., the Intracoastal Waterway, inlets, bridges, etc.) or around jetties.
- d) Laws regarding spearfishing within state waters are complex because of local county and municipality "restricted area" laws. For example, in Monroe County (Florida Keys) spearfishing is allowed in state waters south of Long Key Bridge except in or near public swimming areas, but north of the bridge spearfishing is illegal in any state waters. It is the responsibility of the individual to know the local spearfishing laws.

- e) Permits are required for the collection of certain nonliving structures (like "beach rock") and all plants and animals in state parks and other designated areas. It is the responsibility of the individual to acquire the appropriate permits if collecting is planned. For more information on permitting, contact the Florida Department of Environmental Protection (phone 904-487-3122).

SECTION 15.00 BOATING SAFETY

15.05 General Policy

This section has been developed to standardize procedures and safety guidelines for all non-UNOLS boating operations conducted under the auspices of Florida Atlantic University. FAU personnel may utilize State-owned, privately owned, or commercial charter boats to conduct research and teaching activities.

Diving and Boating Coordinator and Boating Safety Officer (BSO) are equivalent and used interchangeably.

Alcohol or Drugs

- a) Drugs - Florida Atlantic University adheres to a Zero Tolerance policy for illegal drugs aboard FAU vessels. Operators of vessels under the auspices of FAU shall not operate vessels if under the influence of prescription drugs which may impair or influence their judgment or capabilities.
- b) Alcohol - It is strictly prohibited by Federal and State of Florida regulations to operate a vessel under the influence of alcohol. It is the responsibility of the boat operator or captain to ensure that no alcohol is brought onboard unless done in compliance with University Policy 1.2, Alcoholic Beverages.

Smoking

- a) Smoking is not allowed on FAU vessels.

Life Jackets

Coast Guard approved life jackets must be worn by all personnel onboard FAU vessels at all times. The only exception is for vessels large enough to be outfitted with cabins and habitable inside areas, and then only when personnel are inside.

15.12 Definitions

Airboat – a small open boat having a very shallow draft and driven by a caged airplane propeller mounted above the rear transom, capable of traveling at relatively high speeds through shallow water, swamps, etc.

Boat – any small vessel propelled by oars, sail, or power under 65' (20 meters) in length.

Kayak – an Eskimo canoe made of skins completely covering a wooden frame except for an opening in the middle for the paddler or any similarly designed canoe for one or two paddlers using double bladed paddles, made of canvas, plastic, fiberglass, etc.

Canoe – A light, long and narrow boat, usually double ended and usually propelled by one single bladed paddle per person.

Charter Vessel – Any vessel and operator engaged or hired in which compensation is provided beyond reimbursement for operating expenses.

Powerboat - A vessel which employs some type of mechanical propulsion, i.e., a motor.

PWC - Small vessels or conveyances that float on the water and are powered by engines, commonly propelled by jet drives to achieve fairly high speeds, usually in excess of 20 knots.

Sailboat – any small sailing vessel propelled primarily by sails.

Ship – any large seagoing vessel over 65' (20 meters) capable of extended offshore travel.

Rental Boat – Any vessel engaged or hired in which compensation is provided beyond operating expenses and without an operator provided, i.e., “bareboat.”

Vessel – any watercraft or other artificial contrivance larger than a rowboat or canoe used, or capable of being used, as a means of transportation on water.

15.15 Procedures and Regulations

Vessel Operators

All personnel who operate any powered or sail vessel of any type under FAU auspices who do not possess a current captain or yachtmaster license must complete a safe boating course and be checked out to operate specific vessels or boats by the FAU Boating Safety Officer, or designee.

- a) All operators of State-owned or personally-owned power boats, except those holding a valid USCG Captain’s license, must complete a safe boating course recognized by the U.S. Coast Guard and/or approved by the State of Florida. Certification of successful completion must be submitted to and kept on file with the DBC/DBSC prior to operating a vessel. A list of approved classroom and online boating safety course providers is available on the EH&S website (www.fau.edu/ehs) under the “Diving and Boating Safety Program” link.
- b) All operators must demonstrate to the satisfaction of the DBC, or designee, knowledge of safe operating procedures for the boat they will be using including: engine starting, fueling, passenger and vessel safety including man-overboard, docking and undocking, anchoring, knowledge of basic navigation, right-of-way, communications, and filing of float plans. Copies of training and/or check-out records must be on file with the DSO, or designee, prior to any departures.
- c) Airboats – Operators of airboats under FAU auspices must meet minimum training and certification requirements put forward in the South Florida Water Management Airboat Operator Performance Criteria Manual. Certification must be signed by the Boating Safety Officer, or designee, and a copy kept on file with the DDBC.
- d) ALL FAU vessel operators operating small boats at or beyond 12 nautical miles from shore must receive offshore training and be approved for such operation by the DBC, or designee.

Vessel Inspections

A Coast Guard Auxiliary Visual Safety Inspection (VSI) of all vessel or boats used under FAU auspices must be completed annually including:

- a) Vessels and boats registered and/or owned by Florida Atlantic University.
- b) Personally owned vessels or boats used under FAU auspices.
- c) Commercial vessels or boats rented or chartered under FAU auspices.

Vessels maintaining a current U.S. Coast Guard Certificate of Inspection (COI) and is subject to annual U. S. Coast Guard inspections are excepted.

Documentation of all U.S. Coast Guard Auxiliary or U.S. Coast Guard inspections must be submitted to the DBC before any vessel departures are undertaken.

Float Plans

Prior to getting underway, the Boat Operator shall formulate a float plan and submit it to the DBC, or designee, for review, at least five business days prior to any boating operations. No boating activities shall be conducted under FAU auspices without an approved float plan signed by the DBC or designee. If a given trip and/or activity is essentially repetitive, or of an ongoing type, a blanket Float Plan may be filed for a given time period or area of operation at the discretion of the DBC. This does not eliminate the responsibility of the operator to provide daily departure and arrival notification to a designated agent.

Float plan forms can be found either in Appendix D of this manual or on the EH&S website (www.fau.edu/ehs) under the “Diving and Boating Safety Program” link. The forms may be used as is, or, as a template for use by Departments at FAU providing all substantive items are included.

- a) Departure and Arrival Notification – A responsible person not part of the boating operation should be designated to monitor departure and arrival times of each vessel and all passengers aboard. This person should be given a complete copy of the float plan and fully understand missing boat procedures. Additionally, the DBC should receive a copy of all float plans via email or fax.
- b) Arrival Notification - Once a boat returns from an outing, the boat operator must notify the secondary person the float plan was filed with to report that the boat and its passengers have returned safely.
- c) If a boat operator fails to call in upon return or at the scheduled time, the person that the float plan was filed with will initiate an investigation to determine whether the boat has in fact returned or whether Federal or local Search and Rescue agencies should be requested. Once Search and Rescue has been requested the FAU Boating Safety Officer must immediately be notified.
- d) Personal Vessel Liability Coverage - When an appropriate float plan is filed prior to each and every outing, and all other protocols are followed, State of Florida liability insurance

can be extended to each privately owned boat volunteered for University business for that period of time. Be aware that this liability insurance does not cover damages to the boat itself.

Diving and Boating Waiver

All personnel on vessels under FAU auspices must have a Diving and Boating Program Release and Waiver of Liability on file with the DBC. If operations are ongoing, a Waiver may be submitted directly to the DBC and kept on file. For single occurrences or limited durations, a waiver may be attached to the applicable float plan and filed with the DBC.

Exceptions:

- a) FAU employees may, in lieu of a signed waiver, provide proof through Human Resources of current employment status, and documentation of training or equivalent experience on the vessel or similar vessel to be used.

Safety Equipment and Procedures

All vessels in use under FAU auspices must comply with Federal and State of Florida safety regulations.

All vessels or flotillas of vessels (i.e., kayaks) must have at least one first aid kit available. First aid kits should contain at a minimum basic first aid supplies, sunscreen, and insect repellent.

Prior to departure, the vessel operator, captain or supervisor should conduct a safety briefing for participants, passengers and/or crew which at a minimum shall include:

- a) Location of any fire-fighting equipment or fire extinguishers.
- b) Location of life jackets.
- c) Location of any throwable rings or man overboard buoys.
- d) Location of first-aid kit.
- e) Emergency communication procedures.

Chartering and Rental of Boats or Vessels

If a commercial charter vessel is engaged and compensation provided under the auspices of FAU, it is the responsibility of the supervising faculty member, staff, or principal investigator to assure that the vessel is properly licensed, insured and inspected. Further, vessel operators must have and maintain a current captain's license appropriate to the tonnage of the vessel and number of passengers on board.

If a vessel is rented or chartered "bareboat" without a hired operator and compensation provided under the auspices of FAU the supervising faculty member, staff, or principal investigator must assure that the vessel has had an annual safety inspection and meets all required safety regulations.

- a) A Float Plan must be submitted to a responsible agent who will begin notification should the boat fail to return. Additionally, when a copy of the FAU Float Plan is submitted to the Diving and Boating Safety Officer the rental boat and operator are included in Florida Atlantic University liability coverage. Caution: While official FAU projects may receive liability coverage this does not cover any damage to the rental vessel itself. Any FAU personnel renting a boat or vessel should obtain additional coverage for damage which may be caused accidentally or otherwise to the rental vessel.

15.20 Powered boat procedures

Powered boats belonging to FAU as well as those owned personally by an employee or student, or rented or chartered must adhere to the following procedures and requirements:

- a) Prior to each outing, a float plan (Appendix D), submitted to the DBC or a delegated authority, must be completed including the names of all participants.
- b) Prior to each outing a vessel safety checklist (Appendix D) must be completed.

Fueling Procedures

During any fueling operation the following procedures shall be used:

- a) Close all doors, hatches and ports and turn off all electrical equipment.
- b) Turn off stoves, heaters and extinguish all open flames. Advise personnel not to smoke.
- c) For smaller vessels, all unnecessary personnel must exit the vessel during fueling.
- d) After fueling, open all doors hatches and ports. **Operate blowers for at least 4-5 minutes prior to energizing electrical circuits or starting engines.**
- e) Have a fire extinguisher at hand for engine start.

Airboats

- a) Departmental Daily Check-Off Sheets for Airboats must be completed prior to departures.
- b) Pre-Start Checks must be performed prior to starting engines.
- c) Hearing and eye protection for each person on board must be present and worn at any time the engine is running.
- d) Florida state law requires “The exhaust of every engine used on any airboat operated in Florida must use an automotive-style factory muffler, underwater exhaust, or other manufactured device capable of adequately muffling the sound of the engine exhaust. The use of cutouts or flex pipe as the sole source of muffling is prohibited.”

“Airboats must be equipped with a mast or flagpole displaying a flag that is at least 10 feet above the lowest part of the boat. The flag must be square or rectangular, at least 10

inches by 12 inches in size, international orange in color, and displayed so it is visible from any direction.”

15.30 Non-powered Boat Procedures

Non-powered boats including sailboats, kayaks, canoes, rowboats and dingys belonging to FAU as well as those owned personally by an employee or student, or rented or chartered must adhere to the following requirements:

- a) Prior to each outing, a float plan, submitted to the DBC or a delegated authority, must be completed including the names of all participants.
- b) Boating alone under FAU auspices is strictly prohibited. The “buddy system” is to be employed in all boating activities conducted under the auspices of FAU.
- c) Each person must have and wear a Coast Guard approved Personal Floatation Device (PFD).
- d) At least one boat in the group must be equipped with a means of communication such as a cell phone or handheld radio. These items should be stored in waterproof, floating containers when not in use.
- e) Boats should be equipped with a bow and/or stern line to aid in docking or towing.
- f) Lines should be properly stowed when not in use.
- g) In the event that your boat capsizes, account for your safety and the safety of others before attempting to recover equipment.
- h) Offer your assistance to any other capsized boats.
- i) Always remain within sight and voice contact of your group.
- j) Do not overload small boats. If not stated on the boat, contact the manufacturer for weight capacity.
- k) Get off the water as soon as possible when a storm threatens.
- l) Inspect boats frequently to identify cracks or leaks. Damage to a kayak’s bulkheads can severely hinder the vessel’s buoyancy.

15.40 Trailer Procedures

Boats utilized by FAU personnel may need to be transported to and from the work site. Trailers must be legally licensed and/or registered by the State of Florida. The following procedures shall be followed:

- a) Ensure that the boat is securely attached to the trailer. Check gunwale tie downs and straps for wear and proper attachment.
- b) Check that the trailer ball is locked in the socket and any locking pins engaged.

- c) Safety chains must be used and in place.
- d) Dolly wheels must be extended before disconnecting the trailer and retracted before trailers are moved.
- e) Vehicle to trailer electrical harnesses must be secured and all lights and turn signals operable prior to transporting boat.
- f) Ensure that the trailer load is properly balanced. A higher than normal tongue weight will cause the front end of the tow vehicle to rise up, making the vehicle harder to handle. When the tongue weight is too low, the trailer can fishtail. Between five and seven percent of the total weight of the tow (includes the boat, motor, trailer) should be on the tongue.
- g) On boats with outboard motors or outdrives, the motor must be in the “up” position prior to any trailer movement.
- h) Antennas must be lowered prior to moving the trailer.
- i) All loose equipment inside the vessel must be secured prior to trailer movement.

15.50 Pre-launch Procedures

The following steps must be performed prior to launch. As a courtesy to others, do everything you can to ready your boat for launching before moving to the ramp.

- a) Make sure that the drain plug is in place.
- b) Unfasten gunwale tie downs and trailer straps.
- c) Attach lines from your boat to shore before launching and ensure that they are properly manned. The boat may come off the trailer rapidly and may be difficult to control.
- d) Check that all non-essential passengers and crew members are out of the boat before launch.

15.70 Operational Procedures

The following procedures must be observed while operating boats under the auspices of FAU.

- a) A person qualified to operate and maneuver the boat as required must remain on the boat at all times.
- b) During diving, snorkeling or swimming activities, the boat shall fly a diver down flag.
- c) If power driven, adequate fuel to complete the intended trip or trip leg must be on board prior to departure.

Solo Piloting

- a) Solo boat excursions are normally prohibited. Boating activities should employ the “buddy system” to maximize the safety of all personnel involved. Under certain circumstances, solo excursions may be allowed at the discretion of the Diving and Boating Coordinator. Special circumstances may include but are not limited to:
 - 1. Moving the boat for the purposes of fueling.
 - 2. Moving the boat for the purposes of maintenance or shake-down.
- b) Solo pilots are required to have a PFD readily accessible at all times and it is highly recommended that it be worn at all times.
- c) Solo pilots are required to monitor VHF Marine Radio at all times and to carry a charged cell phone.
- d) Under no circumstances will FAU vessels or boats be solo piloted more than 1.0 nautical mile offshore.

15.80 Anchoring and Mooring Procedures

It is the sole responsibility of the vessel operator to assure that vessels are properly anchored or moored and that all Federal, State and local anchoring and mooring laws and regulations are complied with. Anchors must be present on all FAU vessels and should be appropriate for the specific bottom characteristics.

- a) Anchors shall not be dropped on living coral at any time.
- b) Vessel Swinging Arc – Vessels must not be anchored unless there is sufficient space available to adequately allow a 360 degree swing without colliding with objects or other vessels. When mooring on balls or in mooring fields, the mooring line must not exceed a length which will allow the vessel to contact other vessels.
- c) When using mooring fields containing ball color codes, FAU vessels must not utilize balls designated for commercial vessels, or exceed hourly or daily limits. In no case should a dingy ball be used unless the vessel is in fact a dingy or small inflatable.
- d) Anchors and anchor rodes should be of proper composition and include at a minimum an anchor, a chain, and/or the anchor line with appropriate shackles and swivels.
- e) When tying to a mooring ball it is preferable to use a bridle system with both bitter ends affixed port and starboard cleats and the line passed through the mooring ball line eye.
- f) Anchor scope must be at least 7:1 for average conditions and least 10:1 if storm conditions are expected.

15.81 Hurricane and Tropical Storm Emergency Response Plans for FAU Small Boats

Both Florida Atlantic University and State of Florida Statutes require each department or unit with custodial responsibility for small boats registered to FAU to have in place written guidelines as part of the FAU Unit Emergency Response Plan (UERP) with respect to dispensation of those boats in the event hurricane or tropical storm force storms are likely to strike portions of FAU where boats are kept. A current copy of these guidelines must be on file with both the responsible department or unit, and the Emergency Management Coordinator, Environmental Health and Safety.

It is the responsibility of the department or unit head to maintain current plans and contact information on file with EHS. Parties with responsibility for departmental or unit boats and watercraft must develop in conjunction with personnel listed above a set of written hurricane preparedness guidelines for inclusion as Boating Addendum in the departmental or Unit ERPs. Departmental or Unit Response Time

For imminent storm landfalls rated as tropical storm or less as defined by NOAA (National Weather Service) it will be left to the prudent judgment of the department or responsible agent of the department to decide what course of action should be taken with respect to boats and watercraft.

In the event of a hurricane declaration by NOAA or FAU that a hurricane force storm will likely strike portions of FAU where boats are kept, the affected department(s) must activate the Boating Addendum of the Unit Emergency Response Plan at least 72 hours prior to the storm arrival and be completed no less than 48 hours in advance of the storm landfall.

Hurricane Declaration

- a) 72+ Hours Before Landfall:
 1. Review hurricane preparation procedures and assign tasks.
 2. Monitor weather conditions at least every six hours.
- b) +48 Hours Before Landfall (Hurricane Watch):
 1. All trailerable boats should be removed from the water and put on trailers.
 2. If possible, boats on trailers should be moved inside.
 3. Any boat/trailer that will not fit inside needs to be secured. Remove as much as you can from the vessel topsides. Remove all canvases and curtains. Make sure deck and bilge is free of debris so water can drain. Place blocks in front and back of the tires to prevent rolling. Lash trailer down with heavy ropes or chains to concrete blocks or other heavy weights/structures.
 4. If a boat cannot be removed it needs to be secured in the water.
 - a. Use double bow, stern, and spring lines.
 - b. Cover all lines at contact points to prevent chafing.

- c. Tie lines high on pilings to allow for rising water.
 - d. Disconnect shore power.
 - e. Verify battery power is sufficient to run bilge pumps throughout and after the storm.
 - f. Make sure the bilge is free from sludge, debris and any obstructions. Insert plugs in engine ports.
 - g. Close fuel valves and seacocks.
 - h. Make sure all hatches are secured and sealed.
 - i. Remove as much as you can from the vessel topsides.
 - j. Remove all canvases and curtains.
5. If a boat must be removed from FAU property for purposes of storage or safe anchorage, FAU Financial Affairs must provide pre-approval.

Post Storm

- a) Assess damage to vessel(s):
 1. If possible, photograph all damage to vessels, docks, or affected university property. Whenever possible, it is helpful to have photographic records of vessel condition prior to damage occurring to assist in insurance or FEMA claims.
- b) Notify EHS/Boating Safety Officer of any damage to FAU vessel(s):
 1. Include fuel spillage if noted.
- c) Notify Coast Guard or appropriate local authorities for:
 1. Fuel spilled in navigable waters.
 2. Blockage to navigation channels from FAU boats.
 3. Loss of life, injury beyond simple first aid, damage exceeding \$2000.

In the event of a near or direct hit, storm surge will be most likely to occur at HBOI or SeaTech, but may affect other locations where FAU boats are located. Storm surge can cause increased water elevation of sometimes tens of feet particularly if high tide coincides with landfall.

For boats kept in the water, storm surge will likely be the chief agent responsible for damage if action is not taken to maintain the vessel away from docks, piers and pilings. Care must be taken to provide adequate mooring line to allow for surge while at the same time keeping lines tight enough to secure the vessel. Boats on trailers should be stored far enough away from the water to be above the highest possible surge.

ERP Hurricane Response Plan Components for Boats

At a minimum, the Unit ERP Addendum for FAU Small Boats must include:

- a) Contact for person responsible for the boat(s):
 - 1. Name.
 - 2. Telephone number.
 - 3. Email.

- b) Alternate:
 - 1. Name.
 - 2. Telephone number.
 - 3. Email.

- c) Vessel(s) included in the plan:
 - 1. Hull Identification Number.
 - 2. Florida Registration Number.
 - 3. Name or brief description.

- d) Location of vessel(s):
 - 1. Normal location where kept.
 - 2. Hurricane shelter location.

- e) Secure plan:
 - 1. Secure at dock.
 - 2. Secure on trailer.
 - 3. Secure at anchor.

- f) Contact number for Boating Safety Officer, EHS 561-297-3129

Emergency Planning Resources

For help in developing boat hurricane procedures contact the FAU Diving and Boating Coordinator. For detailed Unit ERP development help, contact your department or unit ERP supervisor, or the FAU Emergency Management Coordinator at FAU EHS.

15.82 Accident/Incidents

Procedures

It is unlawful for any person operating a vessel involved in a boating accident to leave the scene without giving all possible aid to the involved persons and without reporting the accident to the proper authorities.

Immediately following an accident:

- a) Determine if the vessel is in danger of sinking or other immediate peril and if everyone is on board.
- b) If there is more than one vessel involved, ascertain as quickly as possible if the other vessel(s) are in danger or if anyone is missing. Render assistance if this can be done without further danger to your vessel or personnel.
- c) If necessary issue a distress call, or notify local EMS. If vessel is inoperable and not sinking, drop anchor if possible to avoid drifting.
- d) If it is necessary to abandon ship, make sure each person has a lifejacket, that flares or other signaling devices are present, and if possible a handheld marine radio. All personnel must remain together at all times and wait for assistance.
- e) As soon as possible after emergency help arrives, notify the DBC, Float Plan Contacts, and family members of the situation.

Distress Calls

It is the responsibility and discretion of the vessel operator or captain to make the decision to request assistance at sea in the event of an emergency. However, for any of the following reasons it is mandatory to request emergency assistance:

- a) When the vessel has become seriously disabled or there is reason to believe it is in the process of becoming seriously disabled.
- b) When there is serious injury.
- c) When the vessel is likely to sink.
- d) When it becomes necessary to abandon ship.

In the event of a serious accident or vessel in distress event, one or all of the following procedures must be used to call for help.

- a) Digital Selective Signaling (DSC) – If vessel radio is equipped with DSC/GPS follow the directions for activation, then immediately follow-up with a voice MAYDAY call.

- b) MAYDAY-On frequency 2182 (offshore) or Channel 16 (near-shore <25-50 nautical miles) state:
 - 1. "MAYDAY, MAYDAY, MAYDAY."
 - 2. Latitude and longitude or proximity to known landmark or aid to navigation.
 - 3. Nature of emergency.
- c) PAN – On Channel 16 state:
 - 1. "PAN, PAN, PAN "
 - 2. "All stations, or the name of a particular vessel or station."
 - 3. "This is (boat name)."
 - 4. "We (nature of emergency)."
 - 5. "We require (type of assistance needed)."
 - 6. "This is (boat name) over."
- d) Activate 406 Emergency Position Indicating Rescue Beacon (EPIRB).
- e) Call 911 if close enough to cell tower.
- f) If no radio or electronic communication is possible, use flares or other distress signaling devices.

Notification

The operator of a vessel involved in a boating accident where there is personal injury beyond immediate first-aid, death, disappearance of any person under circumstances which indicate death or injury, or if there is damage to the vessel(s) and/or personal property of at least \$2,000, must, by the quickest means possible, give notice to one of the following: the Florida Fish and Wildlife Conservation Commission, the sheriff of the county in which the accident occurred, or the police chief of the municipality in which the accident occurred, if applicable. The U. S. Coast Guard must be notified in writing within 48 hours.

- a) After any serious boating accident or incident which results in the disappearance of any person, a fatality, personal injury which requires medical attention beyond first-aid, or damage to vessel(s) and or personal property exceeding \$2000 diving accident or incident, the following personnel must be notified as soon as possible and no longer than 24 hours: Boating Safety Officer, Chairman-Diving and Boating Safety Committee.

- b) The Boating Safety Officer will investigate any serious accident and a written report will be submitted by the Boating Safety Officer within one week to the Chairman, Diving and Boating Safety Committee with the following information:
1. Name, address, phone number of the principal parties.
 2. Summary of experience of operators involved.
 3. Location, description of area of operation and conditions that led up to the incident.
 4. Disposition of the case.
 5. Recommendations to avoid repetition of incident.

15.83 Fuel and Oil Spills Involving FAU Boats or Boats under FAU Auspices

Almost all boat fuel and oil spills of significant quantities must be reported at the time they occur or as soon as is practical by the responsible party (RP) or the person who discovers the spill. Two response components are required:

- a) Notification – who needs to be directly contacted at the university, local, state, and federal levels, depending on the severity of the spill?
- b) Containment/cleanup - will vary with size of spill, proximity to navigable waters, presence of storm drains, and the permeability of the substrate where the spill occurs.

Immediate Action to Be Taken When a Spill Occurs

- a) When a spill occurs, it is the responsibility of the person who discovers the spill to initiate action immediately.
 1. Determine if there are any injured or exposed personnel who may require assistance.
 2. Extinguish all sources of ignition and determine if an explosion hazard exists.
 3. Report the release.
 4. If possible, evacuate personnel from the area. This may not be possible at sea.
 5. If safe to do so, begin containment procedures:
 - a. Stop the release at its source;
 - b. Prevent further dispersal by closing fuel valves and shutting off bilge pumps;
 - c. Deploy booms or absorbent bilge pads or socks.

6. After containment:
 - a. Remove or clean up oil;
 - b. Decontaminate tools or equipment used;
 - c. Arrange for proper disposal of recovered materials through EHS or contractor.

The "Sheen" Rule

- a) The Clean Water Act, Discharge of Oil regulation, more commonly known as the "sheen rule", requires the person in charge of a facility or vessel responsible for discharging oil that may be "harmful to the public health or welfare" to report the spill to the federal government if any of the following criteria are met:
 1. Discharges that cause a sheen or discoloration on the surface of a body of water;
 2. Discharges that violate applicable water quality standards; and
 3. Discharges that cause a sludge or emulsion to be deposited beneath the surface of the water or on adjoining shorelines.
- b) Because the Oil Pollution Act of 1990, which amended the Clean Water Act, broadly defines the term "oil," the sheen rule applies to both petroleum and non-petroleum oils (e.g., vegetable oil).

Information Needed at the Time of Notification

- a) At the time of notification, as much of the following information as possible should be available:
 1. The exact location of the discharge;
 2. The date and time of the discharge;
 3. The type of material discharged;
 4. Estimates of the total quantity discharged;
 5. The source of the discharge;
 6. A description of all affected media;
 7. The cause of the discharge;
 8. Any damages, injuries, potential danger, or threat caused by the discharge;
 9. Actions being used to stop, remove, and mitigate the effects of the discharge;

10. Whether an evacuation may be needed;
11. The names of individuals and/or organizations who have also been contacted;
12. Number and types of injuries (if any);
13. Weather conditions at the incident location;
14. Other information of use to emergency responders; such as, names of responsible parties, vehicle/tanker information (if applicable), and property damage estimates.

Notification Action to be Taken Following a Spill

- a) Contact 911 immediately for fuel or oil spills or exposures which result in:
 1. Fires and/or injuries that require urgent medical attention;
 2. Require, a rescue squad or Medi-vac helicopter dispatch.
- b) Contact the National Response Center (NRC) for any spill that results in:
 1. A violation of state water quality standards;
 2. Visible film or sheen on the water's surface;
 3. Sludge or emulsion deposited below the water's surface;
 4. Release of greater than 25 gallons (or potential > 25 gallons) to any pervious surface;
 5. Response efforts that require additional state or federal assistance.
- c) Contact the Regional EPA or USCG Marine Safety Officer if you are unable to reach the NRC.
- d) Contact FAU EH&S in all cases.

Post Event Written Notification Requirements

- a) All reportable spill events require submission of a written follow up report to either NRC or FDEP, or both. Reports for events under FAU auspices are submitted by EH&S.
- b) As soon as possible, after the release has been cleaned up, appropriate personnel from the University and any outside agencies or contractors involved shall meet to review spill response efforts. Where deficiencies are found, the SPCC Plans and vessel spill procedures shall be revised and amended. A final report shall be submitted to the Diving and Boating Safety Committee with 90 days by the Diving and Boating Coordinator.

Contacts to Report Oil or Fuel Spills (Federal, State, Local)

National Response Center	800-424-8802	
Alt. USCG Radio	Channel 16	
Alt. EPA Region IV	404-562-8700	
Alt. USCG Sector Miami	305-535-4300	
FDEP State Warning Point	800-320-0519	
FDEP South District	294-344-5600	
FDEP Central District	407-897-4100	
EH&S (contact first available in order)	561-297-3129	
Thomas Tomascik, SPCC Coordinator	cell 561-414-3224	office 561-297-2385
David Muncher DBC	cell 561-239-4293	office 561-297-1178
Dennis Zabel, Assoc. Dir (EHS-HBOI)	cell 561-239-4199	office 772-242-2358
Tom Bradley, Director	cell 561-239-4202	office 561-297-3106
University Police		
Boca Raton	911 or 561-297-3500	
HBOI	911 or 772-216-1124	

Florida Contractors with Local Water Fuel Spill Response Capabilities

Clean Harbors, Miramar Florida (24 hr)	800-645-8265
Cliff Berry Environmental Services	800-899-7745
SWS Environmental Services	727-546-6193
Titan Salvage Inc	954-545-4143

15.85 Diving from Vessels

- a) The vessel operator or captain shall be ultimately responsible for the safe conduct of all diving operations. The Dive Supervisor or Lead Diver shall provide the vessel operator or captain with all information requested to assure safety of divers during dive operations.
- b) No FAU vessel operator may allow diving or snorkeling operations to be conducted from a boat or vessel under their authority without a dive plan approved by the Diving Safety Officer.
- c) No divers shall exit or enter the water without permission from the vessel operator or designee. Boat engines must be turned off when discharging or retrieving divers.
- d) If motoring into an area where divers are in the water, vessel must be slowed to idle speed and if available watches should be posted on the bow to look for bubbles.
- e) It is the responsibility of the vessel operator to conduct a head count prior to departing the area of dive operations and assure that all divers and other personnel have been accounted for.
- f) A legal diver's down flag or Alpha flag if in international waters must be displayed from the support vessel at all times when divers are in the water.

- g) The support vessel shall be equipped with a SSB and/or VHF radio and/or cell phone or satellite phone, first-aid kit, and emergency oxygen resuscitator.
- h) When diving in currents, if the vessel is at anchor, a tag line with a float shall be streamed approximately 100' behind the vessel. During drift dives a surface float will be towed by the dive party.
- i) When diving from a mother vessel, a small support vessel shall be readied for immediate launch, or preferably in the water to retrieve fatigued or incapacitated divers.
- j) A boat operator shall remain aboard the support vessel at all times during the dive unless this requirement is waived by the Diving Supervisor under certain circumstances, such as shallow dives in calm conditions or use of permanently moored buoys.
- k) Scuba diving during submersible operations must be approved by the on-board Dive Supervisor and Operations Director; must maintain radio contact with the mother vessel; and must maintain a boat operator on board the support vessel during the dive.
- l) If more than 4 divers are in the water at the same time, the Lead Diver should appoint one person to remain aboard and monitor divers in the water.
- m) Divers must carry a whistle and inflatable emergency tube (diver sausage); for offshore diving, an air-powered horn and safety flares are recommended.
- n) Prior to the dive, the dive team must record the coordinates or location of the dive site, time of start of dive, and planned time for end of dive. This log should remain on board with the boat operator.

Missing Diver Protocols

- a) The Diver Supervisor or Lead Diver must notify the vessel operator or captain immediately if at any time a diver becomes missing.
- b) A float should be anchored at the last known point where the diver was present and a second float should be deployed and allowed to drift with the current.
- c) The vessel operator should recall and recover any remaining divers and begin a search beginning at the dive site and working down current considering the rate of drift.
- d) The vessel operator or captain should establish contact with the Coast Guard (Channel 16 in US).
- e) The vessel operator should issue a general PAN call on Channel 16 and all commonly used channels with the statement: "PAN, PAN ... all vessels please be on the lookout for missing divers, state name and description of your vessel, location, depth, how many divers, and the time they should have surfaced.

15.90 Boating Recommendations

All boaters should consider implementing the following recommendations:

- a) Boaters should complete a basic first aid/ CPR course. Contact FAU EH&S at 297-3129 for training availability.
- b) Due to the warm climate of South Florida and the need to plan for the unexpected, an emergency supply of drinking water should be carried on board the vessel.
- c) All boats should carry:
 - 1. Sunscreen or sun block with UVA/UVB protection.
 - 2. Emergency food and water rations.
 - 3. Cell or satellite phone.
 - 4. VHF Radio (If not required).
 - 5. Extra batteries.
 - 6. Insect repellent.
 - 7. Visual distress signals.
- d) A GPS device to aid in navigation and location of work sites.

15.92 Environmental Awareness and Regulations

Florida Atlantic University supports all efforts by the State of Florida to conserve and protect its natural resources. The following guidelines and regulations are promulgated by the Florida Wildlife Commission and must be observed at all times.

Coral Reefs

- a) Do not drop anchors directly on coral reef structures.
- b) It is illegal to damage coral reefs. Any damage caused to coral reefs must be reported to the FWC and FAU Diving and Boating Coordinator immediately.
- c) Whenever possible utilize mooring balls.
- d) Do not discharge bilges or pump sewage holding over reefs.

Manatees

- a) Manatees are protected by state and federal law.
- b) It is illegal to harass, hunt, capture, or kill any marine mammal, including manatees.
- c) Anything that disrupts a manatee's normal behavior is a violation of law, punishable under federal law up to a \$50,000 fine, one-year imprisonment, or both.
- d) Boaters must observe all manatee protection zone requirements.

- e) Boaters who accidentally strike a manatee are urged to report the strike to the FWC and may not be subject to prosecution, provided they were operating in accordance with any applicable vessel speed restrictions at the time of the strike.

Sea Grass Beds

- a) Sea grasses are the principal food for endangered marine herbivores such as manatees and green sea turtles, act as natural filters to help purify the water, and provide a suitable environment for a wide variety of marine life.
- b) Boaters should make all available attempts to avoid running through sea grass beds.
- c) Navigation charts identify sea grass beds as light green or marked as "grs" on the chart.
- d) Boaters should make all possible attempts to stay within channels when unfamiliar with a waterway.
- e) Avoid taking shortcuts through sea grass beds to avoid causing propeller scars.
- f) It is a violation of Florida law to damage sea grass beds in some areas within state waters.

APPENDIX 1 DIVING MEDICAL EXAM OVERVIEW

DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess their fitness for certification as a Scientific Diver for the FAU Scientific Diving Program. Their answers on the Diving Medical History Form (attached) may indicate potential health or safety risks as noted. Your evaluation is requested on the attached scuba Diving Fitness Medical Evaluation Report. If you have questions about diving medicine, you may wish to consult one of the references on the attached list or contact one of the physicians with expertise in diving medicine whose names and phone numbers appear on an attached list. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the FAU Scientific Diving Program standards. Thank you for your assistance.

Diving Safety Officer

Date

Printed Name

Phone Number

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses, or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgment, emotional stability, or physical fitness. Please consult the following list of conditions that usually restrict candidates from diving.

(Adapted from Bove, 1998: bracketed numbers are pages in Bove)

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears. [5 ,7, 8, 9]
2. Vertigo including Meniere's Disease. [13]
3. Stapedectomy or middle ear reconstructive surgery. [11]
4. Recent ocular surgery. [15, 18, 19]
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression. [20 - 23]
6. Substance abuse, including alcohol [24 - 25]
7. Episodic loss of consciousness. [1, 26, 27]
8. History of seizure. [27, 28]
9. History of stroke or a fixed neurological deficit. [29, 30]
10. Recurring neurologic disorders, including transient ischemic attacks. [29, 30]
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage. [31]
12. History of neurological decompression illness with residual deficit. [29, 30]
13. Head injury with sequelae. [26, 27]
14. Hematologic disorders including coagulopathies. [41, 42]

15. Evidence of coronary artery disease or high risk for coronary artery disease². [33 - 35]
16. Atrial septal defects. [39]
17. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying. [38]
18. Significant cardiac rhythm or conduction abnormalities. [36 - 37]
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD). [39, 40]
20. Inadequate exercise tolerance. [34]
21. Severe hypertension. [35]
22. History of spontaneous or traumatic pneumothorax. [45]
23. Asthma³. [42 - 44]
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae, or cysts. [45,46]
25. Diabetes mellitus. [46 - 47]
26. Pregnancy. [56]

SELECTED REFERENCES IN DIVING MEDICINE

Most of these are available from Best Publishing Company, P.O. Box 30100, Flagstaff, AZ 86003-0100, the Divers Alert Network (DAN) or the Undersea and Hyperbaric Medical Association (UHMS), Bethesda, MD.

ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Gibbons RJ, et al. 1997. *Journal of the American College of Cardiology*. 30:260-311.

<http://circ.ahajournals.org/cgi/content/full/96/1/345>

- Alert Diver Magazine; Articles on diving medicine
<http://www.diversalertnetwork.org/medical/articles/index.asp>
- “Are Asthmatics Fit to Dive? “ Elliott DH, ed. 1996 Undersea and Hyperbaric Medical Society, Kensington, MD.

“Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations.” Grundy et al. 1999. AHA/ACC Scientific Statement.

<http://circ.ahajournals.org/cgi/reprint/circulationaha;100/13/1481>

- DIVING MEDICINE, Third Edition, 1997. A. Bove and J. Davis. W.B. Saunders Company, Philadelphia
- DIVING AND SUBAQUATIC MEDICINE, Third Edition, 1994. C. Edmonds, C. Lowery and J. Pennefather. Butterworth-Heinemann Ltd. Oxford
- MEDICAL EXAMINATION OF SPORT SCUBA DIVERS, 1998. Alfred Bove, M.D., Ph.D. (ed.). Medical Seminars, Inc. San Antonio, TX
- NOAA DIVING MANUAL, NOAA. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
- U.S. NAVY DIVING MANUAL. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

² “Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations.” Grundy et al. 1999. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

³ “Are Asthmatics Fit to Dive? “ Elliott DH, ed. 1996 Undersea and Hyperbaric Medical Society, Kensington, MD.

APPENDIX 2 AAUS MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

Name of Applicant (Print or Type)

Date of Medical Evaluation (Month/Day/Year)

To The Examining Physician: Scientific divers require periodic scuba diving medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). Their answers on the Diving Medical History Form may indicate potential health or safety risks as noted. Scuba diving is an activity that puts unusual stress on the individual in several ways. Your evaluation is requested on this Medical Evaluation form. Your opinion on the applicant's medical fitness is requested. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease (see references, following page). An absolute requirement is the ability of the lungs, middle ears and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant. Please proceed in accordance with the AAUS Medical Standards (Sec. 6.00). If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

TESTS: THE FOLLOWING TESTS ARE REQUIRED:

DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):

- Medical history
- Complete physical exam, with emphasis on neurological and otological components
- Urinalysis
- Any further tests deemed necessary by the physician

ADDITIONAL TESTS DURING FIRST EXAM OVER AGE 40 AND PERIODIC RE-EXAMS (OVER AGE 40):

- Chest x-ray (Required only during first exam over age 40)
- Resting EKG
- Assessment of coronary artery disease using Multiple-Risk-Factor Assessment¹ (age, lipid profile, blood pressure, diabetic screening, smoking)

Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment²

PHYSICIAN'S STATEMENT:

_____ 01 Diver **IS** medically qualified to dive for: _____ 2 years (over age 60)
_____ 3 years (age 40-59)
_____ 5 years (under age 40)

_____ 02 Diver **IS NOT** medically qualified to dive: _____ Permanently _____ Temporarily.

I have evaluated the abovementioned individual according to the American Academy of Underwater Sciences medical standards and required tests for scientific diving (Sec. 6.00 and Appendix 1) and, in my opinion, find no medical conditions that may be disqualifying for participation in scuba diving. I have discussed with the patient any medical condition(s) that would not disqualify him/her from diving but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these conditions.

_____ MD or DO _____
Signature Date

Name (Print or Type)

Address

Telephone Number

E-Mail Address

My familiarity with applicant is: _____ This exam only _____ Regular physician for _____ years

My familiarity with diving medicine is: _____

APPENDIX 2B MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

APPLICANT'S RELEASE OF MEDICAL INFORMATION FORM

Name of Applicant (Print or Type) _____

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the _____ Diving Safety Officer and Diving Control Board or their designee at (place) _____ on (date) _____

Signature of Applicant _____ Date _____

REFERENCES

¹ Grundy, S.M., Pasternak, R., Greenland, P., Smith, S., and Fuster, V. 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. *Journal of the American College of Cardiology*, 34: 1348-1359. <http://content.onlinejacc.org/cgi/content/short/34/4/1348>

APPENDIX 3 DIVING MEDICAL HISTORY FORM

(To Be Completed By Applicant-Diver)

Name _____ Sex ____ Age ____ Wt. ____ Ht. ____

Sponsor _____ Date ____/____/____
 (Dept./Project/Program/School, etc.) (Mo/Day/Yr)

TO THE APPLICANT:

Scuba diving places considerable physical and mental demands on the diver. Certain medical and physical requirements must be met before beginning a diving or training program. Your accurate answers to the questions are more important, in many instances, in determining your fitness to dive than what the physician may see, hear or feel as part of the diving medical certification procedure.

This form shall be kept confidential by the examining physician. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician who must then indicate, in writing, that you have done so and that no health hazard exists.

Should your answers indicate a condition, which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, their written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that they are concerned only with your well-being and safety.

	Yes	No	Please indicate whether or not the following apply to you	Comments
1			Convulsions, seizures, or epilepsy	
2			Fainting spells or dizziness	
3			Been addicted to drugs	
4			Diabetes	
5			Motion sickness or sea/air sickness	
6			Claustrophobia	
7			Mental disorder or nervous breakdown	
8			Are you pregnant?	
9			Do you suffer from menstrual problems?	
10			Anxiety spells or hyperventilation	
11			Frequent sour stomachs, nervous stomachs or vomiting spells	
12			Had a major operation	
13			Presently being treated by a physician	
14			Taking any medication regularly (even non-prescription)	
15			Been rejected or restricted from sports	
16			Headaches (frequent and severe)	
17			Wear dental plates	

	Yes	No	Please indicate whether or not the following apply to you	Comments
18			Wear glasses or contact lenses	
19			Bleeding disorders	
20			Alcoholism	
21			Any problems related to diving	
22			Nervous tension or emotional problems	
23			Take tranquilizers	
24			Perforated ear drums	
25			Hay fever	
26			Frequent sinus trouble, frequent drainage from the nose, post-nasal drip, or stuffy nose	
27			Frequent earaches	
28			Drainage from the ears	
29			Difficulty with your ears in airplanes or on mountains	
30			Ear surgery	
31			Ringing in your ears	
32			Frequent dizzy spells	
33			Hearing problems	
34			Trouble equalizing pressure in your ears	
35			Asthma	
36			Wheezing attacks	
37			Cough (chronic or recurrent)	
38			Frequently raise sputum	
39			Pleurisy	
40			Collapsed lung (pneumothorax)	
41			Lung cysts	
42			Pneumonia	
43			Tuberculosis	

	Yes	No	Please indicate whether or not the following apply to you	Comments
44			Shortness of breath	
45			Lung problem or abnormality	
46			Spit blood	
47			Breathing difficulty after eating particular foods, after exposure to particular pollens or animals	
48			Are you subject to bronchitis	
49			Subcutaneous emphysema (air under the skin)	
50			Air embolism after diving	
51			Decompression sickness	
52			Rheumatic fever	
53			Scarlet fever	
54			Heart murmur	
55			Large heart	
56			High blood pressure	
57			Angina (heart pains or pressure in the chest)	
58			Heart attack	
59			Low blood pressure	
60			Recurrent or persistent swelling of the legs	
61			Pounding, rapid heartbeat or palpitations	
62			Easily fatigued or short of breath	
63			Abnormal EKG	
64			Joint problems, dislocations or arthritis	
65			Back trouble or back injuries	
66			Ruptured or slipped disk	
67			Limiting physical handicaps	
68			Muscle cramps	
69			Varicose veins	

	Yes	No	Please indicate whether or not the following apply to you	Comments
70			Amputations	
71			Head injury causing unconsciousness	
72			Paralysis	
73			Have you ever had an adverse reaction to medication?	
74			Do you smoke?	
75			Have you ever had any other medical problems not listed? If so, please list or describe below;	
76			Is there a family history of high cholesterol?	
77			Is there a family history of heart disease or stroke?	
78			Is there a family history of diabetes?	
79			Is there a family history of asthma?	
80			Date of last tetanus shot? Vaccination dates?	

Please explain any “yes” answers to the above questions.

I certify that the above answers and information represent an accurate and complete description of my medical history.

Signature

Date

APPENDIX 4 RECOMMENDED AREA PHYSICIANS

PHYSICALS

Delray Physician Care Center	561-278-3134
2280 W. Atlantic Avenue, Delray Beach, FL 33445	
Dr. Ira Fine, Institute for Healthy Aging	561-330-3463
101 NW 1 st Avenue, Delray Beach, FL 33444	
US HealthWorks	561-368-6920
1786 NW 2 nd Avenue, Boca Raton, FL	
Family Medicine Center	954-755-4880
10308 W. Sample Road, Coral Springs, FL	
Hillsboro Allergy & Family Medicine.....	954-974-5400
3880 Coconut Creek Parkway #300, Coconut Creek, FL 33066	
Dr. M. Maholtz	772-567-0081
3725 12 th Court Vero Beach, FL32960	
Dr. D. Devault	772-286-5551
816 East Ocean Blvd. Stuart, FL 34994	
Florida Atlantic University Student Health Clinic.....	866-281-9725
Boca Campus, (SS8), Room 222	

APPENDIX 5 DEFINITION OF TERMS

Air sharing - Sharing of an air supply between divers.

ATA(s) - “Atmospheres Absolute”, Total pressure exerted on an object, by a gas or mixture of gases, at a specific depth or elevation, including normal atmospheric pressure.

Breath-hold Diving - A diving mode in which the diver uses no self-contained or surface-supplied air or oxygen supply.

Buddy Breathing - Sharing of a single air source between divers.

Buddy Diver - Second member of the dive team.

Buddy System - Two comparably equipped scuba divers in the water in constant communication.

Buoyant Ascent - An ascent made using some form of positive buoyancy.

Burst Pressure - Pressure at which a pressure containment device would fail structurally.

Certified Diver - A diver who holds a recognized valid certification from an organizational member or internationally recognized certifying agency.

Controlled Ascent - Any one of several kinds of ascents including normal, swimming, and air sharing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

Cylinder - A pressure vessel for the storage of gases.

Decompression Chamber - A pressure vessel for human occupancy. Also called a hyperbaric chamber or decompression chamber.

Decompression Sickness - A condition with a variety of symptoms, which may result from gas, and bubbles in the tissues of divers after pressure reduction.

Dive - A descent into the water, an underwater diving activity utilizing compressed gas, an ascent, and return to the surface.

Dive Computer- A microprocessor based device which computes a diver's theoretical decompression status, in real time, by using pressure (depth) and time as input to a decompression model, or set of decompression tables, programmed into the device.

Dive Location - A surface or vessel from which a diving operation is conducted.

Dive Site - Physical location of a diver during a dive.

Dive Table - A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Diver - An individual in the water who uses apparatus, including snorkel, which supplies breathing gas at ambient pressure.

Diver-In-Training - An individual gaining experience and training in additional diving activities under the supervision of a dive team member experienced in those activities.

Diver-Carried Reserve Breathing Gas - A diver-carried independent supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by another diver.

Diving Mode - A type of diving required specific equipment, procedures, and techniques, for example, snorkel, scuba, surface-supplied air, or mixed gas.

Diving Control Board (DCB) - Group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (Section 1.24).

Diving Safety Officer (DSO) - Individual responsible for the safe conduct of the scientific diving program of the membership organization (Section 1.20).

EAD - Equivalent Air Depth (see below).

Emergency Ascent - An ascent made under emergency conditions where the diver exceeds the normal ascent rate.

Enriched Air (EANx) - A name for a breathing mixture of air and oxygen when the percent of oxygen exceeds 21%. This term is considered synonymous with the term “nitrox” (Section 7.00).

Equivalent Air Depth (EAD) - Depth at which air will have the same nitrogen partial pressure as the nitrox mixture being used. This number, expressed in units of feet seawater or saltwater, will always be less than the actual depth for any enriched air mixture.

fN_2 - Fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

fO_2 - Fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FFW – Feet or freshwater, or equivalent static head.

FSW - Feet of seawater, or equivalent static head.

Hookah - While similar to Surface Supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for monitoring their own depth, time, and diving profile.

Hyperbaric Chamber - See decompression chamber.

Hyperbaric Conditions - Pressure conditions in excess of normal atmospheric pressure at the dive location.

Lead Diver - Certified scientific diver with experience and training to conduct the diving operation.

Maximum Working Pressure - Maximum pressure to which a pressure vessel may be exposed under standard operating conditions.

Organizational Member - An organization which is a current member of the AAUS, and which has a program, which adheres to the standards of the AAUS as, set forth in the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs.

Mixed Gas - MG

Mixed-Gas Diving - A diving mode in which the diver is supplied in the water with a breathing gas other than air.

MOD - Maximum Operating Depth, usually determined as the depth at which the pO₂ for a given gas mixture reaches a predetermined maximum.

MSW - Meters of seawater or equivalent static head.

Nitrox - Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 21% and 40% oxygen. Also be referred to as Enriched Air Nitrox, abbreviated EAN.

NOAA Diving Manual: Refers to the *NOAA Diving Manual, Diving for Science and Technology*, 2001 edition. National Oceanic and Atmospheric Administration, Office of Undersea Research, US Department of Commerce.

No-Decompression limits - Depth-time limits of the “no-decompression limits and repetitive dive group designations table for no-decompression air dives” of the U.S. Navy Diving Manual or equivalent limits.

Normal Ascent - An ascent made with an adequate air supply at a rate of 60 feet per minute or less.

Oxygen Clean - All combustible contaminants have been removed.

Oxygen Compatible - A gas delivery system that has components (o-rings, valve seats, diaphragms, etc.) that are compatible with oxygen at a stated pressure and temperature.

Oxygen Service - A gas delivery system that is both oxygen clean and oxygen compatible.

Oxygen Toxicity Unit - OTU

Oxygen Toxicity - Any adverse reaction of the central nervous system (“acute” or “CNS” oxygen toxicity) or lungs (“chronic”, “whole-body”, or “pulmonary” oxygen toxicity) brought on by exposure to an increased (above atmospheric levels) partial pressure of oxygen.

Pressure-Related Injury - An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include: decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

Pressure Vessel - See cylinder.

pN₂ - Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

pO₂ - Inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

Psi - Unit of pressure, “pounds per square inch.

Psig - Unit of pressure, “pounds per square inch gauge.

Recompression Chamber - see decompression chamber.

Scientific Diving - Scientific diving is defined (29CFR1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

Scuba Diving - A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Standby Diver - A diver at the dive location capable of rendering assistance to a diver in the water.

Surface Supplied Diving - Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the divers’ depth, time and diving profile.

Swimming Ascent - An ascent, which can be done under normal or emergency conditions accomplished by simply swimming to the surface.

Umbilical - Composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies a diver or bell with breathing gas, communications, power, or heat, as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Working Pressure - Normal pressure at which the system is designed to operate.

APPENDIX 6 AAUS REQUEST FOR DIVING RECIPROCITY FORM



VERIFICATION OF DIVER TRAINING AND EXPERIENCE

Diver: _____ Date: _____

This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all requirements necessary to be certified as a Scientific Diver/Diver in Training as established by the Florida Atlantic University Diving Safety Manual, and has demonstrated competency in the indicated areas. Florida Atlantic University is an AAUS OM and meets or exceeds all AAUS training requirements.

The following is a brief summary of this diver's personnel file regarding dive status at FAU:

(Date)

_____ Original diving authorization
_____ Written scientific diving examination
_____ Last diving medical examination Medical examination expiration date _____
_____ Most recent checkout dive
_____ Scuba regulator/equipment service/test
_____ CPR training (Agency) _____ CPR Exp. _____
_____ Oxygen administration (Agency) _____ O2 Exp. _____
_____ First aid for diving _____ F.A. Exp. _____
_____ Date of last dive _____ Depth _____

Number of dives completed within previous 12 months? _____ Depth Certification _____ fsw

Total number of career dives? _____

Any restrictions? (Y/N) _____ if yes, explain:

Please indicate any pertinent specialty certifications or training:

Emergency Information:

Name: _____ Relationship: _____
Telephone: _____ (work) _____ (home)
Address: _____

This is to verify that the above individual is currently a certified scientific diver at Florida Atlantic University.

Diving Safety Officer:

(Signature) (Date)
David A Muncher

(Print)

Florida Atlantic University is an Organizational Member in good standing with the American Academy of Underwater Sciences.

APPENDIX 7 DIVING EMERGENCY MANAGEMENT PROCEDURES

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DIVING EMERGENCY TREATMENT AND EMERGENCY CONTACTS

DIVERS ALERT NETWORK (DAN) **Emergency 919-684-9111** (24 hrs)
..... Non-Emergency 800-446-2670
..... Fax (Chamber Info) 919-493-3040

AIR AMBULANCE

Ft. Lauderdale (Aero Jet International) 888-840-2376
..... 954-730-9300
..... Fax 954-485-6564

AMBULANCE SERVICE

Miami (Fire-Rescue Medical Communications Center- may assist with ambulance dispatch). **911**
..... 305-271-8995

EMERGENCY EVACUATION: U.S.

Miami (U.S. Coast Guard, Search and Rescue Controller) 305-535-4472
U.S. Air Force (Patrick AFB) 321-494-7001
Ft. Pierce Coast Guard (Search & Rescue) 772-464-6100, ext. 1
 Radio HF 2182
 Radio VHF Channel 16
Lake Worth Coast Guard (Search & Rescue) 772-844-4470

EMERGENCY EVACUATION: BAHAMAS

Air Ambulance
Phone: 1-888-840-2376 (DSO must call prior to trip to confirm payment)

U.S. Coast Guard, Miami
Phone: 305-535- 4472 (Search & Rescue Controller)

FLORIDA ATLANTIC UNIVERSITY

Emergency Contact Personnel for Diving Incidents
David Muncher (FAU) Office 561-297-3129/Cell 561-239-4293
John Reed (HBOI) 772-465-2400 ext. 205/Home 772-465-6327
Tim Askew (HBOI) 772-465-2400 ext. 262/Weekend 321-768-6089
Craig Caddigan (HBOI) 772-465-2400 ext. 278/Home 772-878-8312
Shirley Pomponi (HBOI) 772-465-2400 ext. 449/Home 772-567-3684
Florida Atlantic University Police 561-297-3500
HBOI Night Security (Guard House) 772-465-2400 ext. 415

HOSPITALS

Panama City (Panama City Medical Center, Dr. Epstein, Medical Director) 850-747-6000
..... (ER)850-747-6950
Jacksonville (Baptiste Medical Center) 904-202-2136
Melbourne (Holmes Regional Medical Center) 321-434-7000
Sebastian (Sebastian River Medical Center) 772-589-3186
Vero (Indian River Memorial Hospital) 772-567-4311 ext. 4
Ft. Pierce (Lawnwood Medical Center) 772-461-4000
..... (ER) 772-468-4551
Port St. Lucie (St. Lucie Medical Center) 772-335-4000 ext.3181
..... (ER) ext. 6
Stuart (Martin Memorial Hospital) 772-287-5200
..... (ER) 772-223-5995
West Palm Beach (Palm Beach Medical Center) 561-622-1411 ext. 7172
..... (ER) ext. 1
West Palm Beach (Good Samaritan Medical Center) 561-655-5511
..... (ER) 561-650-6250
Miami (Jackson Memorial Hospital) 305-325-7429 ext. 3
University of Miami/Jackson Memorial Medical Center 305-585-3483
..... (ER) 305-585-6677
South Miami (Homestead Hospital) (ER) 305-248-3232 ext. 3510
Tavernier Key (Mariners Hospital) (ER) 305-853-1600
Marathon (Fisherman's Hospital) 305-743-5533 ext. dial "O" for 24-hour access to ER
Fort Myers (SW Florida Regional Medical Center) 239-343-1000

HOSPITALS: BAHAMAS

Lucaya, Grand Bahama Island
Lucaya Medical Center (8:30am-5pm) 242-352-7288
 sister branch same hours 242-373-7400

Nassau, New Providence Island
Liford Cay Hospital 242-362-4025

RECOMPRESSION CHAMBERS

Note: Hyperbaric Chambers listed by DAN as of June 26, 2007

Divers Alert Network (DAN)..... Emergency 919-684-9111 (24 hrs)
..... No n-Emergency 800-446-2670
..... Fax (Chamber Info) 919-493-3040

Bay Medical Center Chamber Phone 850-747-6950
615 North Bonita Ave. Panama City FL 32401..... Hospital (ER) Phone 850-747-6000
..... Fax: 850-747-6208

O2 Wound Care and Hyperbaric Center Chamber Phone: 352-563-2407
1669 S.E. Hwy. 19 Crystal River FL 34429..... Fax: 352-726-2461

Gulf Coast Medical Center Chamber Phone: 239-343-0454
13778 Plantation Road Fort Myers FL 33912

Baptist Medical Center Chamber Phone 904-202-1151
800 Prudential Dr. Jacksonville FL 32207 (ER) Hospital Phone 904-202-2046

Shands Hospital Chamber Phone 352-265-0425
1600 SW Archer Road Gainesville FL 32610 Hospital Phone 352-265-0111
..... Fax 352-265-0327

Florida Hospital Chamber Phone 407-303-5716
601 East Rollins Street Orlando FL 32803..... 24 hr Phone: 407-303-1549
..... Fax. 407-303-7621

Health First Hyperbarics and Wound Center Chamber Phone 321-837-1995
(expected to open by Jan. 2008 for dive emergencies)
24 hr supervisor (Dr. Scott Strong) 321-615-0924
5191 Babcock St. Palm Bay Florida

South Florida Center for H.O.P.E. Chamber Phone 954-571-9392
1898 H. West Hillsboro Blvd. Deerfield Beach FL 33442 Fax 954-571-6788

Mercy Hospital Work Phone..... 305-854-0300
3663 South Miami Avenue P.O. Box 2039 Miami FL 33427-2039 24 hr Phone 800-662-3637

Mariners Hospital
91500 Overseas Hwy. (MM 91.5) Tavernier FL 33070 Chamber Phone 305-434-1603
..... (ER) 24 hr Phone 305-434-1600
..... Fax: 305-434-1599

RECOMPRESSION CHAMBERS: BAHAMAS

Nassau, New Providence Island
Liford Cay Hospital Phone 242-362-4025
Recompression Chamber (Aquatic Safety Services) Phone 242-362- 5765
Dr. Tseretopoulos, Valerie Cooper, Francis Bain

Miami Florida
Mercy Hospital..... Phone: 1-800-NO-BENDS (1-800-662-3637)

Divers Alert Network
Phone: 919-684-9111 (call collect)

RECOMPRESSION CHAMBERS: MILITARY

Note: treatment of civilians at military facilities is entirely at the discretion of the Duty Officer.

NAVY Experimental Diving Unit Dive Locker Phone 850-230-3235
Building 321 24 hr Phone: 850-230-3100
Panama City FL 32407-7015 Fax: 850-234-4238

US ARMY Special Forces Dive School Clinic Phone 305-293-4154
Fleming Key, Boca Chica FL 33040 Base Phone 305-797-2711 or 719-2704

*Call 1-800-NO-BENDS for evacuation to Miami's Recompression Chamber from anywhere in the Continental U.S.A.

NOTE- CHECK NUMBERS FOR ACCURACY PRIOR TO DIVING.
(revised 6/25/07)

EMS CALL-IN DATA REQUIREMENTS

In the event of a Diving Accident, the following data should be available if possible when EMS contact is initiated. And, should be given to EMS transport to be delivered to hyperbaric treatment personnel.

Name of Diver _____

Emergency Contact Name and Phone Number

Details of last dive:

Name of buddy diver _____

Depth _____

Bottom time _____

Breathing gas (air, Nitrox, mix) _____

Decompression table or dive computer used _____

Time at end of dive _____

Time at onset of symptoms _____

Details of previous repetitive dive:

Date/Time _____

Surface Interval _____

Depth _____

Bottom time _____

Name of buddy diver _____

Decompression table or dive computer used _____

Breathing gas _____

Describe symptoms in detail:

What _____

Where _____

Intensity _____

Record any changes in symptoms and time _____

Results of neurological exam, vital signs, and secondary assessment:

Diver's medical history:

Allergies _____

Current medication _____

Recent illness _____

Previous decompression sickness or embolism _____

Describe any treatment of diver:

Medication _____

Record time and volume of liquid intake and output _____

Oxygen (time on/off, %) _____

Recompression chamber:

Test of pressure results _____

Treatment table _____

Time and duration _____

Name of operator _____

Change in symptoms _____

Comments: _____

Introduction

The FAU Dive Accident Management Appendix adapted from the Harbor Branch Oceanographic Institute's Diving Safety and Standards Manual, Appendix 2, and is a compilation of basic information on how to identify and stabilize a diving accident victim and how to get a diver into the hyperbaric trauma care system (diving physician and recompression chamber). It is meant for use as a guide by FAU divers, Diving Supervisors, Divers-in-Charge and evacuation personnel who have little understanding of hyperbaric (diving) medicine.

Portions of this manual have been excerpted from the following sources:

American Heart Association, 1992. Cardiopulmonary Resuscitation CPR. Fourth Edition. CPR Publishers, Inc./ Tulsa, OK, 56 pp.

Cory, J., 1989. Student Workbook for Emergency Oxygen Administration and Field Management of Scuba Diving Workshop. National Association of Underwater Instructors. 65 pp.

Daugherty, C.G., 1992. Field Guide for the Diver Medic. Coastal Aquatics Publications, Austin TX, 177 pp.

Davis, J. (ed.), 1986. Medical Examination of Sport Divers. Best Publ. Co., P.O. Box 1978, San Padre, CA 90733.

Divers Alert Network, 1993. DAN Underwater Diving Accident Manual. Divers Alert Network, Duke University Medical Center, Durham, NC, 69 pp.

Divers Alert Network, 1993. DAN Oxygen First Aid in Dive Accidents. Divers Alert Network, Duke University Medical Center, Durham, NC, 63 pp.

Hendrick, W. and A. Zaferes, 1991. The Field Neurological for Diving Emergencies. Lifeguard Systems, Inc., 28 pp.

NURP, 1987. Diving Operations and Procedures Manual. National Oceanic and Atmospheric Administration, National Undersea Research Program at Univ. North Carolina at Wilmington, 93 pp.

Harbor Branch Oceanographic Manual, 2009. Diving Standards and Safety Manual, Ft. Pierce, FL, 160pp.

Rutowski, D., 1991. Recompression Chamber Life Support Manual. Rosentiel School of Marine and Atmospheric Science, Univ. of Miami, 110 pp.

Woods Hole Oceanographic Institution, 1983. Diving Safety Manual, 89 pp.

General Procedures

A diving accident victim could be any person who has been breathing air underwater regardless of depth. It is essential that emergency procedures are pre-planned and that treatment is initiated as soon as possible. A comprehensive list of emergency phone numbers and contacts for diving physicians and recompression centers can be found in Appendix 7, pg. 122 and in conjunction with this section should be used as a guide to on-site response to diving emergencies, and in preparing the Diving Accident Emergency Management Plan sheet of the FAU Dive Plan (Appendix E, pg. 173).

Preparedness

- All diving personnel must be prepared to respond in the event of a diving accident.
- Periodic retraining and routine practice are essential elements in emergency preparedness; emergency drills are encouraged.

On-Site Accident Management Procedures

- The Diver-in Charge or Diving Supervisor shall take charge at the scene of the accident and delegate tasks to other responsible individuals.
- Stabilize life-sustaining functions and follow the Accident Management Flow Chart.
- Establish radio communications through the Master of the Vessel, or phone contact with local EMS, with the predetermined medical facility.
- Transmit the following information to the physician:
 1. Accident Call-in Data
 2. Neurological Exam Checklist
 3. Checklist for Secondary Assessment of Injury
- All diving equipment of accident victim must be kept intact and tagged for later inspection and analysis.
- In certain cases or circumstances, recompression treatment may be conducted in onboard recompression chambers. In such circumstances, the medical standing orders shall follow the protocol of FAU/HBOI's Recompression Chamber Manual, Daugherty's Field Guide for the Diver's Medic (1992), and the U.S. Navy Diving Manual (1993).

Emergency Evacuation

- If afloat, the Master of Vessel should contact the U.S. Coast Guard (radio HF-2182, VHF Channel 16) or other appropriate authorities.
- If on land, contact local EMS and follow EMS directions.
- Follow medical evacuation procedures.
- Follow helicopter procedures, as necessary.

Notification of Authorities

- After any serious diving incident, The Lead Diver or Diving Supervisor must notify the Diving Safety Officer, or as soon as possible and provide the following:
 - Complete AAUS Incident Report Form
 - Name, address, phone numbers of the principal parties.
 - Summary of experience of divers involved.
 - Location, description of dive site and description of conditions that led up to the incident.
 - Description of symptoms, including depth and time of onset.
 - Description and results of treatment.
 - Disposition of the case.

- Recommendations to avoid repetition of incident.
- The FAU DBSC will investigate and document any incident of pressure-related injury and prepare a report which is to be forwarded to the AAUS during the annual reporting cycle. This report must be first reviewed and released by the FAU DBSC.
- After any diving incident resulting in any injuries or symptoms, a written report (using the AAUS Accident or Incident Reporting Form), shall be submitted within one week by the Diver-In-Charge to the DSO.

Medical Procedures

Depending on the nature of the diving accident, stabilize the patient, administer oxygen, and contact the diving physician, and contact air transport and also recompression chamber, if necessary. Explain the following steps to evacuation teams, medics and physicians. Do not assume that they understand why oxygen may be required for all diving accident victims or that recompression treatment may be necessary.

- Administer CPR, if required.
- Keep air-way open and prevent aspiration of vomitus.
- Protect victim from excessive heat or cold and treat for shock, if necessary.
- Administer 100% oxygen by tight-fitting mask at the highest possible oxygen concentration.
- Do not remove oxygen unless necessary to reopen air-way or victim shows signs of convulsions.
- If convulsion occurs, do not forcefully restrain but hold loosely to prevent self-injury. Resume oxygen administration after convulsions subside.
- Do not give pain killing drugs.
- Give conscious patients non-alcoholic liquids such as fruit juices or water. Try to achieve urine output of 1-2 ounces (30-60 cc)/hour. Discontinue fluids if victim is unable to urinate.
- For conscious or seriously injured victims, qualified medical personnel may administer intravenous electrolyte solutions, e.g., Ringer's lactate or normal saline (100cc/hour). Do not use 5% dextrose in water.
- Administer rapid neurological exam, check for secondary injuries, and fill out medical logs, if time and circumstances permit.
- Contact physician experienced in diving medicine or Divers Alert Network, and state information recorded.
- If recompression treatment is required, contact recompression facility before sending victim.
- If air evacuation is required, instruct the flight crew that cabin pressure must be maintained close to sea level as possible and below 800 feet.
- Transport with victim the information recorded above and also the diving buddy, if possible.
- The victims depth gauge, tank, regulator and other diving equipment must be kept intact and tagged for later inspection and analysis.

In any diving accident, certain questions should be resolved quickly in order to best ascertain course of action. Most important of all, did the victim breath compressor air at depth? If not the accident should not in fact be treated as a dive accident at all. This is an important consideration for emergency medical personal and physicians to know when a victim is to be transported to a treatment facility. Next, are the symptoms severe (life threatening), or mild (can wait until medical help is reached).

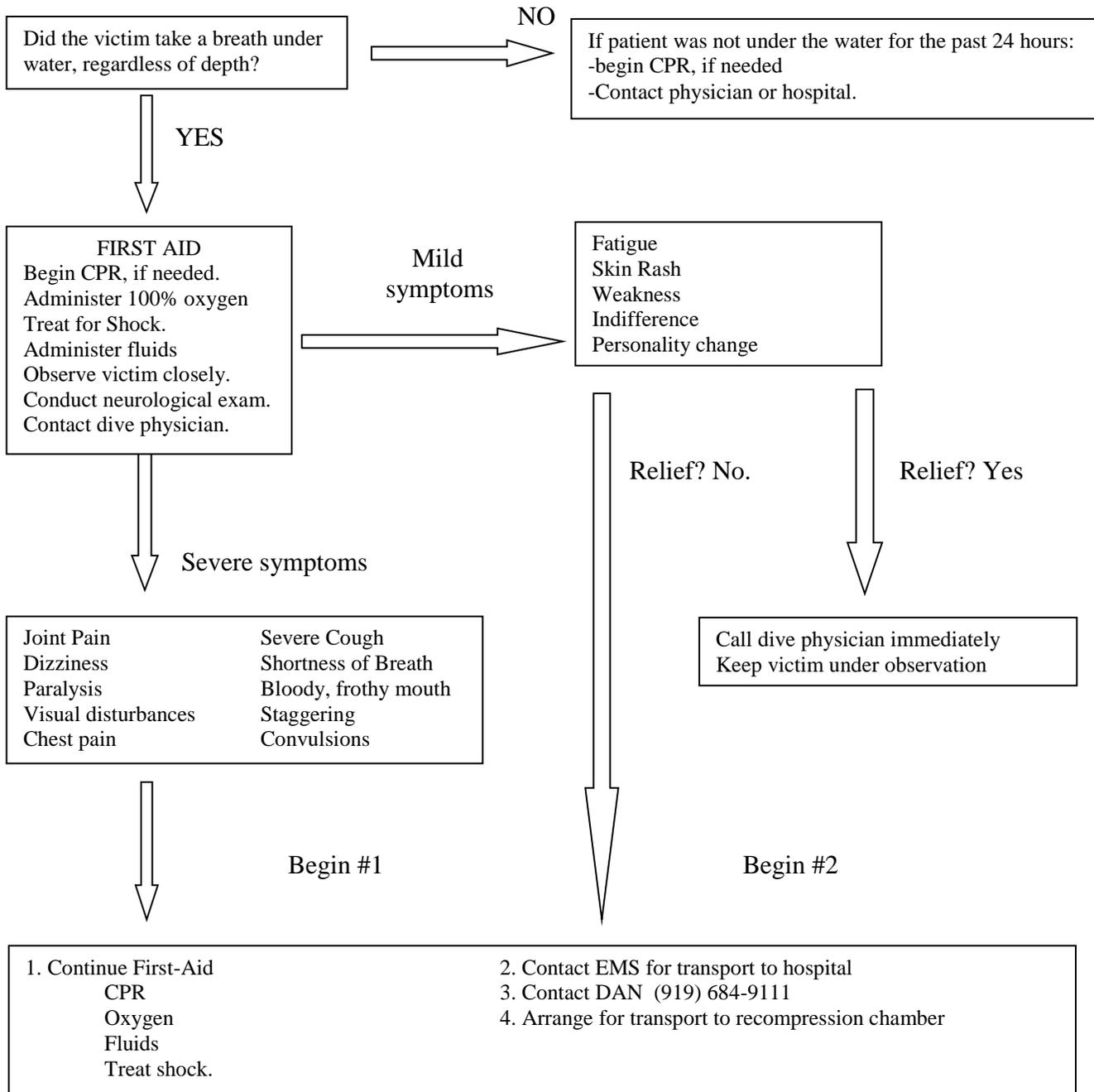
DIVING ACCIDENT MANAGEMENT FLOWCHART

Contact:

Divers Alert Network (DAN)
 Duke University Medical Center
 Emergency Hotline (919) 684-9111
 Non-Emergency (919) 684-2948 or (800) 446-2670

BASIC STEPS FOR DIVING ACCIDENTS

1. Establish (A)irway, (B)reathing, (C)irculation.
2. Administer 100% oxygen.
3. Call local Emergency Medical System (EMS) for transport to nearest hospital.
4. Call DAN (919-684-9111 in USA) for contact with diving physician and recompression chamber.



CARDIOPULMONARY RESUSCITATION (CPR)

	Objectives	Actions			
		Adult (over 8 yrs.)	Child (1 to 8 yrs.)	Infant (under 1 year)	
A. Airway	1. Assessment: Determine unresponsiveness.	Tap or gently shake shoulder. Say, "Are you okay?"		Observe	
	2. Get help.	Call out "Help!"			
	3. Position the victim.	Turn on back as a unit, supporting head and neck if necessary. (4-10 seconds)			
	4. Open the Airway.	Head-tilt/chin-lift			
B. Breathing	5. Assessment: Determine breathlessness.	Maintain open airway. Place ear over mouth, observing chest. Look, listen, feel for breathing. (3-5 seconds)			
	6. Give 2 Rescue Breaths.	Maintain open airway.		Mouth to nose/mouth	
		Seal mouth to mouth.			
			Give 2 rescue breaths, 1 to 1 ½ seconds each. Observe chest rise. Allow lung deflation between breaths.		
	7. Option for obstructed airway.	a. Reposition victim's head. Try again to give rescue breaths.			
		b. Activate the EMS system.			
		c. Give 6-10 subdiaphragmatic abdominal thrusts (the Heimlich maneuver).		Give 4 back blows.	
				Give 4 chest thrusts.	
d. Tongue-jaw lift and finger sweep.		Tongue-jaw lift, but finger sweep only if you see a foreign object.			
If unsuccessful, repeat a, c, and d until successful.					

C. Circulation	8. Assessment: Determine pulselessness.	Feel for carotid pulse with one hand: maintain head-tilt with the other. (5-10 seconds)		Feel for brachial pulse; keep head-tilt.	
	9. Active EMS system	If someone responded to call for help, send them to activate the EMS system.			
	10. Begin Chest compressions: 11. Landmark check 12. Hand position 13. Compression rate	Run middle finger along bottom edge of rib cage to notch at center (tip of sternum).		Imagine a line drawn between the nipples.	
		Place index finger next to finger on notch:		Place 2-3 fingers on sternum, 1 finger's width below line.	
		Two hands next to index finger. Depress 1 ½-2 in.	Heel of one hand next to index finger. Depress 1-1 ½ in.		Depress ½-1 in.
		80-100 per minute		At least 100/minute	
CPR Cycles	14. Compressions to breaths.	2 breaths to every 30 compressions.			
	15. Number of cycles.	4 (52-73 seconds)	10 (60-87 seconds)	10 (45 seconds or less)	
	16. Reassessment.	Feel for carotid pulse (5 seconds)		Feel for brachial pulse.	
If no pulse, resume CPR, starting with 2 breaths.		If no pulse, resume CPR, starting with 1 breath.			
Option for entrance of 2nd rescuer: "I know CPR. Can I help?"	1 st rescuer ends CPR	End cycle with 2 rescue breaths.		End cycle with 1 rescue breath.	
	2 nd rescuer checks pulse (5 seconds).	Feel for carotid pulse.		Feel for brachial pulse.	
	If no pulse, 2 nd rescuer begins CPR	Begin one-rescuer CPR, starting with 2 breaths.		Begin one-rescuer CPR, starting with 1 breath.	
	1 st rescue monitors 2 nd rescuer.	Watch for chest rise and fall during rescue breathing; check pulse during chest compressions.			
Option for pulse return	If no breathing, give rescue breaths.	1 breath every 5 seconds	1 breath every 4 seconds	1 breath every 3 seconds	

Oxygen Administration

When oxygen is breathed, the oxygen partial pressure (PO₂) of the blood is increased. This establishes a steeper gradient across the bubble-tissue interface and aids in the elimination of inert gases (from the bubble), reducing the bubble size to some extent. Additionally, the elevated (PO₂) allows better oxygenation of tissues where the blood supply is marginal, because the initial bubble has impaired that flow. Although this discussion relates to the use of oxygen at sea level as a first aid measure, the same principles apply to the use of oxygen under hyperbaric conditions.

Tissue integrity depends essentially upon two factors: (1) adequate PO₂ and (2) adequate flow to deliver the oxygen. Even though there is some vasoconstriction, the flow should be adequate with the improved PO₂ to help reduce bubble size to supply oxygen-poor tissues.

Oxygen Cautions and Recommendations

- If a demand mask is not properly sealing, re-position the mask on the face. Further problems may require pulling the mandible tighter into the mask. Do not push the mask tighter into the face as this may close the air-way.
- While most demand valves shut off automatically, over-inflation of a victim's lungs is still a concern. When positively ventilating a non-breathing victim, release the "purge button" as soon as the chest begins to rise to prevent damage to the lungs or inflation of the stomach. If gastric distension occurs during positive pressure ventilations, re-evaluate the airway.
- Only non-breathing adult victims may be manually ventilated with a positive pressure demand valve.
- It is important to watch for vomiting. Ventilating a victim with a demand valve often leads to vomiting. If a victim begins to vomit, remove any mask from the face, immediately pull the victim onto their side, and assist in removing any vomit from the airway.
- A diving victim should be closely monitored at all times. A diving victim on oxygen should never be left unattended.
- Flow rates should be adjusted such that mask reservoir bags do not completely deflate with each inspiration of the victim.
- Oxygen should be delivered with a diving victim in the supine position. The victim must be flat on their back if resuscitation is required.
- Oxygen equipment should not be used in the presence of oils, greases, flammable substances, or burning tobacco.
- High oxygen concentrations should not be delivered to hyperventilating victims or victims with chronic obstructive pulmonary disease (emphysema).
- Positive pressure demand valves and airway adjuncts should only be used on victims by rescuers with appropriate local certification(s).
- Rescuers should be CPR certified.
- Additional cylinders may be advantageous for extended oxygen delivery times.
- Extra regulator washers should be carried with oxygen equipment.
- Local protocols for the administration of oxygen should be followed.

Emergency Evacuation

Once it has been established that the patient is a diving accident victim, and someone is caring for his immediate medical needs (vital signs, surface oxygen, shock, etc.), someone must also be initiating the evacuation protocol into the hyperbaric trauma system.

Because many divers and/or boaters fail to plan emergency evacuation procedures in advance, a great amount of critical time is often lost, causing needless suffering and possible loss of life. The most important part of any dive and/or boat trip is to know your procedure for emergency evacuation.

Many medical problems, including those resulting from diving accidents, could occur at any time at sea. Because some symptoms are delayed in their onset, it is not only necessary to know how to contact a hyperbaric trauma team at sea, but also on land. Many divers have been diving in one country and returned to another before symptoms occurred.

Communications

If you have a radio on board, contact the Coast Guard Directly, 2182 HF or channel 16 VHF marine band. Declare an emergency and state the type of emergency, e.g., “This is a diving accident victim needing treatment in a recompression chamber”. Give your exact location by direction and distance from prominent land marks. Give all symptoms of the victim and dive history if applicable. State the condition of victim, i.e., can he walk, sit up, or is he unconscious. Describe any unusual circumstances, and the number of victims. Give a detailed description of your boat including any outstanding features for identification. Give weather, sea condition, wind direction and speed.

If you should change your location, keep all concerned advised of your new location and your intentions.

The coast guard does monitor CB, CH9. This is a very unreliable means of communications for many reasons. If you are unable to raise the Coast Guard via CB, contact someone else to relay your messages.

If you have no radio on your boat, if practical, hail a boat with a marine band radio and give them the information to relay to the Coast Guard. Keep them with you for further contacts. The International Convention of safety of life at sea requires the providing of assistance to vessels in distress.

If no other boats are immediately available, proceed immediately to the nearest inhabited dockage and telephone local par-medical or USCG services. Advise them of a diving accident, state your need for transportation and your EXACT location. Have someone remain at the telephone for further assistance. Insure that they are aware at this time that a recompression chamber will be needed.

If symptoms occur on land after diving, contact local para-medics or USCG. They should be able to assist or advise location of nearest recompression chamber.

When the rescue aircraft arrives in your area, wave, fire flares or smokes, LET THEM KNOW YOU ARE THE ONES WHO WANT ASSISTANCE. Do not assume the pilot will recognize you. He may waste valuable time searching for you unnecessarily.

Helicopter Evacuation Procedures

Each helicopter evacuation is different, each one presents its own problems, but knowing what to expect and the procedures to follow can save time, effort, and perhaps a life.

- Try to establish communications with the helicopter. If your boat is unable to furnish the necessary frequency, try to work through another boat.
- Maintain speed of 10 to 15 knots, do not slow down or stop.
- Maintain speed into wind about 20 degree's in the port bow.

- Out all antennas down if possible, without losing communications.
- Secure all loose objects on/around decks.
- Always let the lifting device (stretcher) touch the boat before handling it to prevent electric shock.
- Place life jacket on the patient.
- Tie patient in basket, face up.
- If patient cannot communicate, place in the stretcher as much information as you can about him, such as name, age, address, what happened, and what medication he has been given.
- If the patient is a diving accident insure flight crew has a copy of, or is instructed on medical procedures for diving accidents.
- If diving victim, insure flight crew delivers victim to hyperbaric trauma system (recompression chamber complex).

Recompression Chamber Requirements

Diving accident management protocol suggests a recompression chamber that is a multi-lock and 6 atmospheres. Do not take critical diving accident victims to a chamber which is one-man, single lock, 3 atmospheres. There are two major reasons why.

1. Pressure may be sufficient to reduce bubble size (gas embolism requires 6 atmospheres).
2. Physicians have no way of getting hands on victim to:
 - a. Maintain vital signs.
 - b. Keep airway clear.
 - c. Perform neurological examinations necessary to determine proper treatment, or reoccurrence of symptoms.
 - d. Monitor vital signs during treatment.
 - e. Operations may have to be performed, such as intubation.
 - f. Pulmonary over-distention cases may have air leakage causing a tension pneumothorax which must be relieved, and monitored during decompression periods.
 - g. Oxygen convulsions may close off victim's glottis, and victim could develop an embolism while dropping pressure to relieve convulsions.
3. Mixed gas capabilities for saturation treatments.

Be very cautious about transporting patients in small one-lock chambers for the above reasons. It is often better to transport without chamber and maintain vital signs using surface oxygen.

The Underwater Diving Accident Victim

Arterial gas embolism and decompression sickness are the two most frequent serious SCUBA related accidents. Arterial gas embolisms are blockages due to bubbles in arteries carrying blood up to the brain. Decompression sickness is the syndrome of joint pains (the bends), chest pains and shortness of breath, numbness, paralysis and other symptoms resulting from surfacing too rapidly from a dive. Both conditions can be fatal.

An underwater diving accident victim may be any person who has been breathing air underwater regardless of depth. Gas embolisms can occur in as little as four feet of water if one ascends holding their breath. Even a well-trained diver may encounter problems because of respiratory problems. Asthma, broncholithiasis, congenital or acquired cysts, emphysema, fibrosis, tuberculosis, infection, and obstructive lung diseases may result in air-trapping during ascent. The expansion of trapped air may be

sufficient to rupture air spaces and the escaping air may cause emphysema of the lungs, mediastinum or neck. More serious problems of pneumothorax or arterial air embolisms may also result.

Decompression sickness can occur in any individual who violates the decompression tables either willingly or unintentionally when surfacing from greater than 30 feet.

To insure a successful treatment, instructors, dive masters, paramedics, emergency room personnel, and physicians must be able to recognize the problem and begin proper treatment while arranging entry into the hyperbaric trauma system.

In any situation suggesting an underwater diving accident, the primary question is “did the subject breathe compressed air underwater?” If the answer is “yes”, or if the victim is unconscious then the subject must be regarded as a diving accident victim. The diving accident treatment procedure must be initiated immediately. This includes basic life support, administering oxygen, Trendelenburg position, and immediate evacuation to the recompression chamber complex. See Flow Chart.

Mild Symptoms

Mild symptoms may respond to treatment at the scene using oxygen. Fatigue, skin rash, and weakness are considered a minor symptom, but frequently require recompression and are handled as a severe symptom in the Flow Chart. A neurological examination must be completed to determine presence of severe symptoms.

If a diver surfaces from a dive and behaves in an unusual manner, appears confused or has fatigue, weakness or skin rash, he may have early symptoms of an underwater accident.

Immediately place the diver on 100% oxygen. Refer to the Flow Chart and follow through. Oxygen treatment often relieves the symptoms or prevents them from getting worse. The victim will probably deny the possibility of having a problem and any refuse oxygen. Good judgment should prevail and the diver should receive treatment. If the symptoms appear relieved after an interval of oxygen treatment, do not remove the oxygen immediately as the symptoms may recur. The victim should continue to receive oxygen for thirty minutes. Follow the Flow Chart for further instructions.

Severe Symptoms

Severe symptoms consisting of pain, weakness or paralysis, staggering, respiratory difficulties (chokes) or unconsciousness require immediate treatment and evacuation into the hyperbaric trauma system. Cardiopulmonary resuscitation will be required if the victim has no pulse or respiration. If a person at any time within 24 hours after a dive shows any of the severe symptoms indicated on the flow chart, immediately provide the victim with oxygen (100% or highest possible concentration). Monitor pulse and respiration and follow the instructions in the Flow Chart until evacuation to a recompression chamber has been accomplished.

It is important to remember that because these signs and symptoms can develop hours after diving, the patient may show up in a hospital emergency room or other medical facility in the community. For this reason, it is important for paramedics and physicians to recognize the symptoms and to understand this problem so that the underwater diving accident procedure can be initiated. It is also extremely important that any person delivering an underwater diving accident patient to a medical facility PROVIDE THAT FACILITY WITH THIS MANUAL AND THE COMPLETE HISTORY RECORDED ON THE FORMS UNINCLUDED IN THIS MANUAL. The manual should stay with the patient until he reaches

the Hyperbaric Trauma Center in order to provide those caring for the patient with full information concerning the accident.

Air Embolism

As a diver surfaces without exhaling, air trapped in the lungs expands and may rupture lung tissue releasing gas bubbles into the circulatory system where they may be distributed to the body tissues. The ascending diver is normally in a vertical position and the bubbles tend to travel upward toward the brain, eventually reaching a small artery blocking circulation. The effects of halting circulation to the brain are critical and require immediate treatment. Symptoms of embolism may be present when the victim reaches the surface or within a few minutes afterward.

CAUSE: 1. Holding breath during ascent while breathing compressed gas.
 2. Possible result of panic.
 3. Lung disease resulting in air trapping.

SYMPTOMS: 1. Dizziness
 2. Visual blurring
 3. Bloody froth from mouth or nose
 4. Paralysis or weakness
 5. Unconsciousness

Note: Symptoms usually appear immediately after surfacing or within 15 minutes usually.

SIGNS: 1. Bloody froth from mouth or nose
 2. Paralysis or weakness
 3. Convulsions
 4. Unconsciousness
 5. Cessation of breathing

PREVENTION 1. Always exhale during ascent
 2. Get a periodic medical examination by a physician knowledgeable in diving medicine.

TREATMENT: Place victim flat on back, slight head down for shock; turn head if vomiting. Administer oxygen at 100% or highest possible concentration and continue while transporting to a recompression chamber. UNDER NO CIRCUMSTANCES SHOULD THE VICTIM BE RETURNED TO THE WATER FOR TREATMENT.

Decompression Sickness

Decompression sickness (bends, Caisson disease) is the result of inadequate decompression following exposure to increased pressure. While inadequate recompression is not usually a matter of life and death as with air embolism, the quicker recompression is initiated the better the rate of recovery. The body tissue absorbs gas in proportion to the surrounding pressure and as long as the diver remains at pressure, the gas presents no problem. If the pressure is too quickly removed (as in rapid surfacing), the inert gas comes out of solution and forms in the tissues and blood stream.

CAUSE: Inadequate decompression

SYMPTOMS:

1. Extreme fatigue
2. Skin itch
3. Pain in arms and legs
4. Dizziness
5. Paralysis
6. Shortness of breath
7. Collapse or unconsciousness

NOTE: Symptoms and signs usually appear anywhere between 15 minutes and 24 hours after surfacing.

SIGNS:

1. Skin may show a blotchy rash
2. Paralysis
3. Staggering
4. Choking

PREVENTION:

1. Strict observance of NO DECOMPRESSION LIMITS
2. No diving if hung over, intoxicated or tired.

TREATMENT Decompression sickness requires recompression as soon as possible. Any symptoms except itching are considered serious, but even the mild symptoms suggest that the victim should be monitored very closely for the later development of a more serious problem. The victim should receive 100% oxygen during transportation to a recompression chamber.

Carbon Dioxide Excess

CAUSE:

1. Loss of air supply
2. Improper use of closed circuit SCUBA
3. Over-exertion
4. Skip breathing

SYMPTOMS

1. Sometimes none
2. Labored or rapid breathing
3. Headache, dizziness, weakness, nausea
4. Unconsciousness

PREVENTION

1. Diver should stop, rest, ventilate and surface if breathing becomes labored
2. Avoid causes listed above

TREATMENT

1. Give oxygen
2. CPR if not breathing

Pneumothorax

Air enters chest cavity causing lungs to collapse.

CAUSE: Holding breath during ascent

- SYMPTOMS**
1. Shortness of breath
 2. Sharp pain in chest
- SIGNS:**
1. Rapid shallow breathing
 2. Blueness of skin, lips, and fingernails
 3. Lungs sound different from one side to another
- Prevention:** Exhale during ascent
- Treatment:**
1. Do NOT use recompression without chest tube
 2. Physician will insert chest tube to withdraw air and reinflate lung
 3. 100% oxygen, medical attention, contact hyperbaric physician.

Mediastinal Emphysema

Air released into tissues surrounding the heart.

- CAUSE:** Holding breath during ascent
- SYMPTOMS:**
1. Faintness
 2. Shortness of breath
 3. Pain under breastbone
- SIGNS:**
1. Difficulty in breathing
 2. Change in voice
- PREVENTION:** Exhale during ascent
- TREATMENT:**
1. Do NOT use recompression unless complicated with air embolism or decompression sickness or life-threatening complications.
 2. Observe for other problems
 3. 100% oxygen, medical attention, hyperbaric physician.

Subcutaneous Emphysema

Air trapped under skin (usually around neck)

- CAUSE:** Holding breath during ascent
- SYMPTOMS:**
1. Feeling of fullness around neck
 2. Change in voice
- SIGNS:**
1. Swelling during ascent
 2. Difficulty swallowing
 3. Crackling sound when skin is pressed
- PREVENTION:** Exhale during ascent
- TREATMENT:**
1. No real emergency

2. Usually no treatment needed
3. Observe for other problems
4. 100% oxygen, medical attention, hyperbaric physician.

IMMERSION HYPOTHERMIA AND COLD WATER NEAR-DROWNING

BY Capt. M.J. Nemiroff, 1988 From NAUI Workbook

Immersion hypothermia and cold water near-drowning are often natural consequences of scuba diving accidents such as decompression sickness and air embolism. Hypothermia is a condition in which the body's core temperature has lowered below 95 degrees Fahrenheit. Cold water near-drowning is considered to be a submersion accident in water temperatures of 70 degrees Fahrenheit or less that often leads to unconsciousness or coma. A long submersion time is considered to be 4-6 minutes or longer.

The body loses heat to its environment by:

- Conduction: transfer of heat by direct contact with the water, air, or ground;
- Convection: transfer of heat by air or water that is moving away from the body;
- Radiation: transfer of energy by non-particulate means such as from an unprotected head;
- Evaporation: conversion or perspiration into water vapor thereby absorbing calories of heat; and
- Respiration: exhalation of water vapor carrying with it heat from the body.

Immersion Hypothermia

Hypothermia may be mild, moderate, or severe. The victim may exhibit symptoms ranging from shivering and piloerection ("goosebumps") to profound confusion, irreversible coma, and death. Significant hypothermia begins at core body temperatures of 95 degrees Fahrenheit and below. The lowering of the body temperature occurs as the body is robbed of heat by the surroundings. Water conducts body heat away up to 26 times faster than air of the same temperature. Normal body functions slow down with decreasing heart, respiratory, and metabolic rates. Thought processes are impaired and speech becomes confused while reflexes are slowed and muscles become stiff and unusable. In the advanced stages of hypothermia, life-threatening heart rhythms develop which are difficult to reverse.

Upon submersion of the body in very cold water, response actions occur immediately. An involuntary gasp and sudden hyperventilation are followed by a varying amount of diving response. The diving response is more evident in the very young (infants and toddlers). It consists of a slowing of the heart beat, a decrease or actual cessation of respiration, and a dramatic change in circulation with blood circulation to only the inner core of the body: heart, lungs, and brain. This individual appears dead to the casual observer who is seeing a cold, blue, non-breathing victim. Cold water immersion victims have been fully resuscitated when treated carefully with a variety of rewarming techniques ranging from warm blankets to complete cardiopulmonary bypass in major hospitals.

The potential rescuer must remember that there are differences in cooling rates depending upon the age, sex, body weight, clothing, nutritional status, general health, and specific diseases of the victim as well as the water temperature, length of exposure, areas exposed to heat loss, nature of the water movement, circumstances of the immersion, and ultimately, the victim's "will to live".

Remember: Immersion hypothermia should be considered a factor in most diving accidents. The body loses its temperature in a variety of ways while the victim is still in the water, during management of the accident after removal from the water, and during transport. Cold water immersion victims may appear to be dead but may be resuscitatable.

SIGNS AND SYMPTOMS

1. Shivering
2. Lowered body temperature
3. Cold, blue skin
4. Slow heartbeat
5. Slow respiration
6. Slurred speech
7. Confusion
8. Muscle stiffness
9. Cardiopulmonary arrest

TREATMENT

The basic goals of treatment are to prevent cardiopulmonary arrest, stabilize the core temperature, and carefully transport the victim to definitive medical care.

1. REMOVE THE VICTIM FROM THE COLD ENVIRONMENT.

2. ENSURE AIRWAY, BREATHING, CIRCULATION, AND DEGREES (ABCD).

As well as ensuring that the victim has an open airway, is breathing, and has heart beat, determine the victim's body temperature. Most clinical thermometers only measure temperatures as low as 94 degrees Fahrenheit. Low reading thermometers for hypothermia victims are commercially available and should be included in all diving first aid kits. As always, if the victim is not breathing and the heart not beating, standard cardiopulmonary resuscitation

(CPR) should be started immediately.

3. PREVENT FURTHER HEAT LOSS.

Remove wet clothing, gently dry the neck, and cover high heat loss areas of the body such as the head, neck, lateral thorax, and groin areas. The head and neck account for 50% of the body's heat loss.

4. HANDLE THE VICTIM GENTLY.

As the body rewarms, it initially becomes colder for a short time. This is known as *afterdrop*. During this period, the heart is extremely vulnerable to the development of life-threatening rhythm disturbances. The victim should be removed horizontally from the water and kept in a supine position. A litter or stretcher should be used to carry the victim since exercising, jumping, climbing, or other exertion on the part of the victim may trigger the heart rhythm disturbance. Victims of hypothermia typically deny that are ill and tend to decline medical treatment. Many times they want to climb into the responding ambulance or helicopter without assistance. The victim's judgment may be clouded and the rescuer's should prevail! Afterdrop can be prolonged by certain "field treatments". A cigarette, hot cup of coffee, or a drink of alcohol which are all time-honored treatments, generally prolong the afterdrop exposing the victim to greater risk and do not help the hypothermic victim recover. They should not be provided to hypothermic individuals with core temperatures below 95 degrees Fahrenheit.

Cold Water Drowning

Submersion accidents leading to unconsciousness in waters colder than 70 degrees Fahrenheit occur with regularity. The body's oxygen requirements are significantly reduced when the body is cold. Permanent brain damage from low oxygen states will not occur as quickly as when the body is warm. Successful resuscitations have been seen with victims submerged as long as sixty (60) minutes. Similar to victims suffering from hypothermia, the cold water near-drowning victim will generally appear blue and cold to the touch, exhibit no apparent respiration or heart beat, and have pupils which are fixed and dilated. The following factors affect the survivability of cold water near-drowning victims:

Age	:	The younger the better;
Length of Submersion:		The shorter the better;
Water Temperature	:	The colder the better;
CPR Quality	:	The cleaner the better;
Victim Struggle	:	The more they struggle the worse the results; and,
Other Injuries	:	Burn and blast injuries as well as fractures reduce the chances of survival.

Remember: Cold water near-drowning is more survivable than previously thought. Victims who have been submerged as long as an hour may still be fully resuscitated. Cold water may be protective to some body systems since oxygen needs are markedly reduced.

SIGNS AND SYMPTOMS

- | | |
|--|-----------------------|
| 1. Cough with clear to frothy red sputum | 4. Confusion to coma |
| 2. Blue skin color | 5. Respiratory arrest |
| 3. Shortness of breath | 6. cardiac arrest |

TREATMENT

1. REMOVE THE VICTIM FROM THE WATER.
2. DO NOT PERFORM ABDOMINAL THRUSTS (HEIMLICH MANEUVER) EXCEPT TO CLEAR A CONFIRMED, OBSTRUCTED AIRWAY.

Abdominal thrusts may induce vomiting and cause aspiration of vomitus and water into the lungs.

3. ENSURE AIRWAY, BREATHING, AND CIRCULATION (ABC).

Initiate cardiopulmonary resuscitation (CPR) as required.

4. PREVENT FURTHER HEAT LOSS.

Remove wet clothing, gently dry the skin, and cover high heat loss areas of the body such as the head, neck, lateral thorax, and groin areas. The head and neck account for 50% of the body's heat loss.

5. HANDLE THE VICTIM GENTLY.

6. ADMINISTER 100% OXYGEN.

Heated oxygen administration should only be attempted with cardiac monitoring in place and only by personnel capable of treating cardiac dysrhythmias. In selected cases, heated oxygen (105 – 108 degrees Fahrenheit) has been successfully used to stabilize body temperature and reduce further loss.

7. TRANSPORT TO NEAREST MEDICAL FACILITY.

The sooner a victim is transported to a medical facility the better he/she will probably resolve. Do not forget that a diving accident such as decompression sickness or air embolism may have led to the cold water near-drowning in the first place. A successful resuscitation may only be possible within a recompression chamber which will ultimately be necessary for treatment of the compressed-gas injuries.

DIVER INJURY DIAGNOSIS KEY

<u>Symptom/Sign</u>	<u>Circumstances</u>	<u>Probable Injury</u>	<u>Management</u>
Bleeding/external ear	Ear pain during descent/ascent	Ruptured eardrum	Terminate diving; nothing in ear; avoid contamination; medical attention
Bleeding/external ear	Hit head	Fractured skull	Keep victim lying down and inactive; keep warm; <u>no fluid</u> ; do not elevate feet; constant attendance; immediate medical attention
Spitting blood	Ear pain during or following ascent	(1) Ruptured eardrum (2) Middle ear	See Above (Ruptured Eardrum) Terminate diving; medical attention if drainage/discomfort persist
Spitting/coughing blood; bloody froth	Emergency ascent	Pulmonary injury; possible air embolism	Observe for illness and signs of neurological damage (visual disturbances, paralysis, personality changes, etc.); head down; treat shock, 100% oxygen; medical attention; transport to recompression facility.
Bloody discharge/nose	Pain in sinuses during ascent/descent	Sinus squeeze (or reverse sinus squeeze)	Terminate diving; medical attention if drainage/discomfort persist.
Chest pain/ breathing	Emergency/ uncontrolled ascent; Chest congestion prior to dive	Pneumothorax/mediastinal /emphysema/sub-cutaneous emphysema	See Air Embolism
Neurological abnormalities including: loss of balance/coordination visual disturbance rigidity/numbness of extremities paralysis personality changes	Emergency/uncontrolled ascent; congestion prior to diving; smoker; symptoms dramatic & sudden; inadequate decompression	Air embolism or decompression sickness	100% oxygen; medical transport to recompression facility; CPR if indicated; never leave victim unattended

Bluish coloration	Emergency/uncontrolled ascent; chest congestion prior to dive; chest pain following dive	Pneumothorax/mediastinal emphysema	See Air Embolism
Swelling in neck area	Emergency/uncontrolled ascent; chest congestion prior to dive; chest pain following dive	Subcutaneous emphysema	See Air Embolism
Unconsciousness	Occurs while or shortly after surfacing from a dive	Air embolism or decompression sickness	See Air Embolism
Respiratory or cardiac arrest	Occurs while or shortly after surfacing form a dive	Air embolism or decompression sickness	See Air Embolism
Pain in joints or extremities	Occurs shortly after surfacing from a dive near or beyond no-decompression limits	Decompression sickness	See Air Embolism
Bluish coloration	Loss of consciousness during dive; closed circuit or mixed gas	CO ₂ Excess or hypoxia	Surface; resuscitation; oxygen; medical attention; do not exclude air embolism
Reddish coloration	Loss of consciousness during or after dive	CO Poisoning	See CO excess; oxygen until turned over to physician; monitor continuously
Respiratory distress with strong oil taste	Oil contamination of breathing supply	Oil pneumonia	Medical attention

NEUROLOGICAL EXAMINATION

This short examination may be administered by personnel without medical training. It only requires the ability to recognize and report any abnormalities that may be the result of a diving malady and not a previous condition. Vital signs and neurological examination should be repeated every 15-30 minutes and reported as provided on page 150.

A. VITAL SIGNS

Pulse/minute
Blood Pressure
Respirations/minute

B. MENTAL STATUS

Orientation

Time – what day is this?
Place – where are you?
Person – what is your name?

Memory

Immediate – use simple math
Recent – happenings within past 24 hrs.
Remote – background

Mental Function

Test using serial 7's.
Subtract 7 from 100, then 7 from 93, etc.
If an error is repeated, like 93, 90, 83, 80, then state so in report.

Level of Conscious

Check for any fluctuations. Check whether alert, verbal, able to respond to mild pain, unresponsiveness.

Seizures

Describe degree and duration.

Bladder Control

Describe any difficulties with either retention or movement.

Bowel Control

Describe any difficulties with either retention or movement.

C. CRANIAL NERVES

Eyes

Sight – hold fingers up; test one eye at a time.

Movement – have patient’s eyes follow your finger up and down, right and left. Eyes should track together.

Pupils – both should be round and nearly (not exactly) the same size. If light shined in one eye, both pupils should react. Repeat on opposite side.

Face

Both sides should move equally. Have patient raise eyebrows, frown, close eyes tightly, smile and show teeth. Clench teeth and feel jaw muscles on both sides for equal firmness.

Mouth

Uvula – should rise when patient says “ah”

Tongue – when stuck out, it should not deviate to either side; it should be able to wiggle side to side.

Ears

Ask if hearing seems normal, if there is any roaring, humming or ringing in ears. With patient’s eyes closed, test one ear at a time by rubbing fingers approximately one inch from the ear.

Neck Muscles

Have patient shrug shoulders while you press down on them; note any unilateral weakness. Have patient turn chin sideways against palm of your hand; feel the force for each side.

D. STRENGTH

Major muscle groups are tested by feeling their force against resistance. The right and left sides are compared.

Upper Extremities

Have patient squeeze your fingers (dominant hand may be stronger). Grip patient's hand and have him pull and push against you. Have patient hold palms together while you attempt to separate them. Have patient hold elbows out to the side and resist downward pressure.

Trunk

Check for problems sitting or standing upright. Have patient bend over and straighten.

Lower Extremities

With patient sitting place your hands on patient's leg just above ankle and press down lightly; have patient try to lift legs. While your hand is beneath the ankle and pulling lightly upward; have patient push down with legs. Have patient raise each big toe and hold it against resistance.

E. SENSATION

Sensory symptoms may consist of pain, numbness, tingling, hot-cold sensations, or a wooly, heavy feeling in an extremity. Do not use the question, "Can you feel this?", but rather, "Does this feel normal?" Compare right and left sides. If any numb areas, mark area on body with pen and time.

Light Touch

Drag finger tips lightly over top, sides, and back of head, and face. Check front and back of arms, legs, and trunk. Check fingers, toes, palms and soles of feet.

Sharp and Dull

Using eraser and tip of pencil, press on patient's skin and ask patient to identify whether sharp or dull. Compare right and left sides as some areas are normally more sensitive. Drag point across body surface (vertically on body and around extremities) looking for strips of numbness or areas having a different feeling.

Position

Have patient close eyes. Move various joints up, then down, and have patient say which direction they were moved.

F. COORDINATION

Gait

Have patient walk heel to toe forward, then backwards. Check for unsteadiness, rubbery legs.

Balance

Have patient stand with feet together, arms away from sides, then close eyes. The patient should be able to stand easily, but some swaying is normal.

Orientation in Space

With eyes closed have patient put heel on opposite kneecap, then slide it down the front of the leg to the big toe; repeat on opposite side. With eyes open have patient move a finger from touching your finger tip to the tip of his nose, and repeat several times.

G. REFLEXES

Babinski Reflex

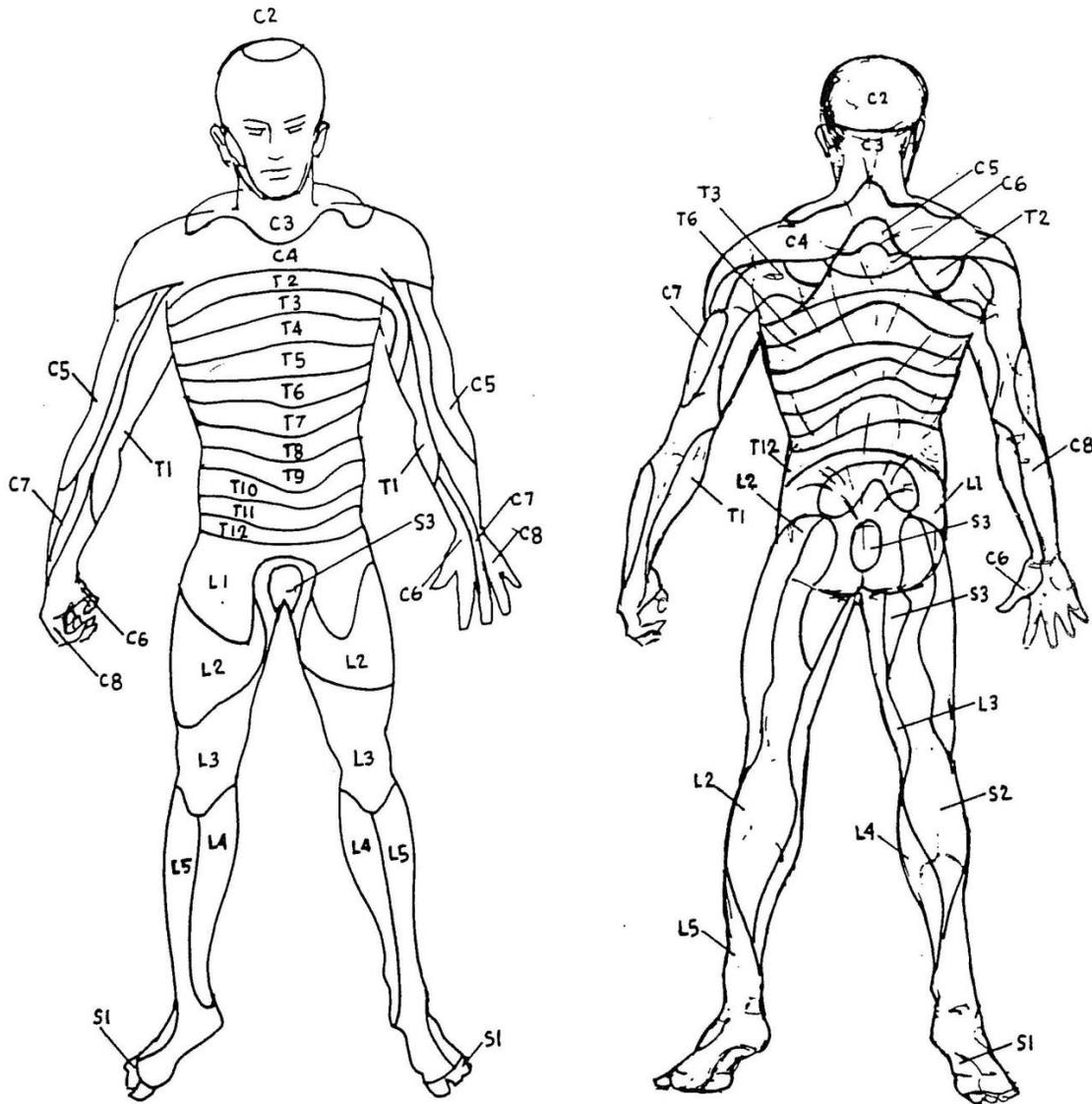
Run a blunt object up the sole of the foot. If the toes curl down, a normal response is present. If nothing happens, no conclusion can be drawn. If the toes curl up, backward and spread, then the response indicates probable spinal involvement.

NEUROLOGICAL EXAMINATION CHECKLIST

Patient's Name _____

Date _____

Time of Exam _____



A central nervous system (CNS) problem can easily be missed in early stages if CNS symptoms are not understood. A little numbness or weakness developing in the pointer finger of one hand might for example, indicate a DCS "hit" in the C6 area of the spinal cord (the sixth bone in the cervical spine). Any signs or symptoms of numbness, tingling, weakness, and especially paralysis should be carefully, closely, and continuously monitored. Numbness in the right ring finger might lead to full right-sided paralysis if the problem is AGE, or to full paralysis from C7 down to the toes if there was a C7 DCS "hit".
 C (Cervical). T (Thoracic). L (Lumbar). S (Sacral).

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A. VITAL SIGNS

- 1. Pulse _____
- 2. Blood Pressure _____
- 3. Respiration _____

B. MENTAL STATUS

- 1. Orientation
 - Time _____
 - Place _____
 - Person _____
- 2. Memory
 - Immediate _____
 - Recent _____
 - Remote _____
- 3. Mental Function

- 4. Level of Consciousness

- 5. Seizures

- 6. Bladder Control

- 7. Bowel Control

C. CRANIAL NERVES

- 1. Eyes
 - Sight R _____ L _____
 - Movement R _____ L _____
 - Pupils R _____ L _____
- 2. Face
 - Close Eyes Tightly _____
 - Frown _____
 - Smile _____
 - Clench Teeth _____
- 3. Mouth
 - Uvula _____
 - Tongue _____
- 4. Hearing R _____ L _____
- 5. Neck Muscles
 - Shoulder Shrug _____
 - Turn Head _____

D. STRENGTH

- 1. Upper Extremities
 - Hands R _____ L _____
 - Arms R _____ L _____
- 2. Trunk _____
- 3. Lower Extremities
 - Legs R _____ L _____
 - Feet R _____ L _____

E. SENSATION

- 1. Light Touch
 - Head R _____ L _____
 - Arms R _____ L _____
 - Fingers R _____ L _____
 - Palms R _____ L _____
 - Front Torso R _____ L _____
 - Back Torso R _____ L _____
 - Legs R _____ L _____
 - Toes R _____ L _____
 - Soles R _____ L _____
- 2. Sharp/Dull
 - Arms R _____ L _____
 - Front Torso R _____ L _____
 - Back Torso R _____ L _____
 - Legs R _____ L _____
- 3. Position
 - Arms R _____ L _____
 - Legs R _____ L _____

F. COORDINATION

- 1. Gait _____
- 2. Balance _____
- 3. Orientation _____

G. RELEXES

- 1. Babinski R _____ L _____

CHECKLIST FOR SECONDARY ASSESSMENT OF INJURY

Equipment: This exam can be conducted with minimal equipment (a stethoscope, blood pressure cuff, watch and light are needed).

This exam is to be conducted after the primary exam and after life threatening conditions have been stabilized. When the exam is completed, all conditions noted are to be prioritized and emergency medical service contacted.

Examination Checklist

1. ___ Skull: Feel entire skull for fractures, lumps, cuts
2. ___ Skull: Check for fluid draining from ears or nose (do not stop fluid if present)
3. ___ Eyes: Pupils equal and reactive to light
4. ___ Face: Check for broken bones, cuts, missing/broken teeth
5. ___ Jaw and Throat: Take pulse on neck
6. ___ Upper Spine: Run fingers along spine as far as able without disturbing patient or twisting spinal cord and feel for any deformity
7. ___ Shoulders and Clavicle: Feel for breaks
8. ___ Chest: Feel ribs, sternum, and xiphoid
9. ___ Chest: Use stethoscope – listen to heart and lungs
10. ___ Lower Spine: Run fingers along and feel for deformity
11. ___ Abdomen: Gentle pressure in each of the four quadrants. Feel for hardness or pain stimulus

Upper Right

Liver
Colon
Gall Bladder

Upper Left

Stomach
Spleen
Transverse Colon

Lower Right

Cecum
Appendix
Ascending Colon

Lower Left

Descending Colon

12. ___ Pelvic: Check hips and pubic bone for breaks
13. ___ Legs: Check for breaks, check knee area
14. ___ Feet: Check for breaks and circulation
15. ___ Arms: Check for breaks and circulation
16. ___ Hands: Check for breaks
17. ___ Complete set of vitals:
_____ Blood Pressure
_____ Pulse Rate
_____ Respiration Rate

Comments: _____

DIVING ACCIDENT / INCIDENT REPORT FORM

NOTE: FAU Scientific Divers shall use this form to report diving related accidents, injuries, and incidents including; near-drowning, decompression sickness, gas embolism, lung overexpansion, or injuries that require hospitalization as well as any incidents that compromised diver safety or might result in later hospitalization, therapy, or litigation. **FAU Dive Logs for all dives related to the accident / incident must also be submitted with this report.** Contact the FAU Dive Safety Officer at 561-297-3129 with questions about whether or not to report an incident.

GENERAL INFORMATION ABOUT THE ACCIDENT/ INCIDENT VICTIM

DIVER NAME:		DATE & TIME OF INCIDENT:	
DIVE LOCATION:	DIVING CERTIFICATION LEVEL: <input type="checkbox"/> Scientific Diver <input type="checkbox"/> Diver-In-Training <input type="checkbox"/> Temporary Diver		CERTIFICATION DEPTH:
CURRENT MEDICATIONS:		CURRENT HEALTH PROBLEMS:	
If the diver is not anFAU-certified diver, complete this section. FAU-certified divers skip to the next section.			
AGE:	SEX: (M/F)	DIVER'S AGENCY OR ORGANIZATION:	AGENCY OR ORGANIZATION DSO NAME & TELEPHONE #:
# YEARS DIVING:	TOTAL # DIVES:	# DIVES LAST 6 MONTHS:	PREVIOUS DIVE INCIDENTS & DATES:

DESCRIPTION OF THE ACCIDENT / INCIDENT:

Please describe accident / incident in detail. Include ANY factor which you believe may have contributed to, or minimized the accident / incident. If more than one accident / incident occurred please fill out a separate form. Use extra paper if necessary.

What could have been done to prevent this accident / incident?

<p>Did the accident / incident cause harm: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not known</p> <p>Specify :</p> <p>Did the accident / incident occur in training: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not known</p> <p>Specify :</p>	<p>Diver's qualification: (may circle >1)</p> <table style="width: 100%; border: none;"> <tr> <td>Diving student DS</td> <td>Open waterOW</td> </tr> <tr> <td>Advanced diver.....AD</td> <td>DivemasterDM</td> </tr> <tr> <td>Dive instructor DI</td> <td>Untrained UT</td> </tr> <tr> <td>Professional PD</td> <td>Technical diver.....TD</td> </tr> <tr> <td>Not known NK</td> <td>CDAA... Cavern CA</td> </tr> <tr> <td>Other.....</td> <td>.. Sinkhole SI</td> </tr> <tr> <td></td> <td>..Cave CV</td> </tr> <tr> <td></td> <td>.. Penetrat. PN</td> </tr> </table>	Diving student DS	Open waterOW	Advanced diver.....AD	DivemasterDM	Dive instructor DI	Untrained UT	Professional PD	Technical diver.....TD	Not known NK	CDAA... Cavern CA	Other.....	.. Sinkhole SI		..Cave CV		.. Penetrat. PN
Diving student DS	Open waterOW																
Advanced diver.....AD	DivemasterDM																
Dive instructor DI	Untrained UT																
Professional PD	Technical diver.....TD																
Not known NK	CDAA... Cavern CA																
Other.....	.. Sinkhole SI																
	..Cave CV																
	.. Penetrat. PN																

Contributing Factors (Check all that apply):

<input type="checkbox"/> Inadequate knowledge <input type="checkbox"/> Unfamiliar diving environment/conditions <input type="checkbox"/> Unfamiliar diving equipment <input type="checkbox"/> Inexperience in diving <input type="checkbox"/> Poor dive planning <input type="checkbox"/> Insufficient training in diving <input type="checkbox"/> Failure to check <input type="checkbox"/> Lack of a buddy check <input type="checkbox"/> Haste <input type="checkbox"/> Inattention <input type="checkbox"/> Fatigue <input type="checkbox"/> Anxiety <input type="checkbox"/> Recent illness	<input type="checkbox"/> Poor physical fitness <input type="checkbox"/> Feeling unwell <input type="checkbox"/> Error in judgement <input type="checkbox"/> Poor communication <input type="checkbox"/> Malfunction of equipment <input type="checkbox"/> Failure to understand equipment <input type="checkbox"/> Lack of servicing of equipment <input type="checkbox"/> Poor servicing of equipment <input type="checkbox"/> Lack of post dive equipment maintenance <input type="checkbox"/> Inadequate supervision of diver <input type="checkbox"/> Sea sickness <input type="checkbox"/> Poor technique <input type="checkbox"/> Recreational drug/alcohol/hangover pre dive
--	---

Did the accident / incident involve any of the following (Circle all that apply):

Low air situation LA Out of air situation OA Rapid ascent RA Unable to slow rapid ascent ... US Out of air ascent OR Buddy breathing BB Octopus breathing OB Pony bottle breathing PB Multiple ascents AA Buoyancy problem BP Problem on ascent PA Problem at safety stop SS Deco stop missed DS Not detected by buddy check ... ND Nausea, vomiting U/W NV	Problem at deco stop DE Poor buddy pairing BP Poor buddy response BR Loss buddy contact BC Marine animal MA Equalization problem descent ... ED Equalization problem ascent ... EA Equipment EP Poor visibility/silting PV Strong current SC Flying <24hrs after diving FL Altitude >300ms after diving .. AL Panic PC Anchor retrieval AR Entanglement/trapped/guideline.. ET
---	--

First Aid:

<input type="checkbox"/> No O ₂ available / limited O ₂ supply <input type="checkbox"/> O ₂ ran out <input type="checkbox"/> O ₂ used inappropriately	<input type="checkbox"/> Lack of trained 1 st aid assistance <input type="checkbox"/> Lack of first aid supplies <input type="checkbox"/> Poor first aid
---	---

Gas Supply

Gas supply in use during dive: Air Nitrox Mixed gas O₂ No/poor analysis pre dive
 Confusion gas mix during dive Air consumption greater than usual this dive: Yes No

Equipment involved in the accident / incident (Check all that apply):

<input type="checkbox"/> Hired <input type="checkbox"/> Borrowed <input type="checkbox"/> New <input type="checkbox"/> Misuse <input type="checkbox"/> Essential equipment lacking <input type="checkbox"/> Equipment forgotten			
<input type="checkbox"/> Torch <input type="checkbox"/> Surface signal device <input type="checkbox"/> Dive Flag <input type="checkbox"/> Alternative air supply <input type="checkbox"/> Weight belt <input type="checkbox"/> Weights <input type="checkbox"/> Ankle weights <input type="checkbox"/> Tank/cylinder <input type="checkbox"/> Compressor/ Hookah	<input type="checkbox"/> Mask <input type="checkbox"/> BCD <input type="checkbox"/> Fins <input type="checkbox"/> Snorkel <input type="checkbox"/> Wet suit <input type="checkbox"/> Dry suit <input type="checkbox"/> Lyrca suit <input type="checkbox"/> Knife <input type="checkbox"/> Contents gauge	<input type="checkbox"/> Depth gauge <input type="checkbox"/> Dive computer <input type="checkbox"/> Regulator <input type="checkbox"/> Watch/Timer <input type="checkbox"/> Camera/trophy bag <input type="checkbox"/> Rebreather <input type="checkbox"/> Exit ladder <input type="checkbox"/> Boat <input type="checkbox"/> Surface buoy	<input type="checkbox"/> Mouthpiece <input type="checkbox"/> Scooter <input type="checkbox"/> Reel or line <input type="checkbox"/> Shot/safety line <input type="checkbox"/> Gloves <input type="checkbox"/> Climbing equipment <input type="checkbox"/> Other Specify _____

Regulator and Gas Supply (Check all that apply):

<input type="checkbox"/> Low to out of air <input type="checkbox"/> Contents not analysed prior to dive or incorrectly <input type="checkbox"/> Air not turned on <input type="checkbox"/> Air not turned on fully <input type="checkbox"/> Air turned on then off prior to dive <input type="checkbox"/> Air supply turned off inappropriately <input type="checkbox"/> Didn't check contents gauge regularly	<input type="checkbox"/> Inaccurate contents gauge <input type="checkbox"/> Unable to read contents gauge <input type="checkbox"/> Contents gauge hose rupture/leak <input type="checkbox"/> Hose rupture/leak <input type="checkbox"/> Pillar valve problem <input type="checkbox"/> 1 st stage malfunction <input type="checkbox"/> 2 nd stage malfunction	<input type="checkbox"/> Free flowing 2 nd stage <input type="checkbox"/> Octopus 2 nd stage problem <input type="checkbox"/> 'O' ring problem <input type="checkbox"/> Regulator breathing resistance increased <input type="checkbox"/> Unable to purge 2 nd stage <input type="checkbox"/> Pony bottle problem <input type="checkbox"/> 'Octopus' reg snagged	<input type="checkbox"/> Unable to locate alternative air supply <input type="checkbox"/> Air used frequently to maintain buoyancy <input type="checkbox"/> Tape on pillar valve <input type="checkbox"/> 1 st stage attached incorrectly <input type="checkbox"/> Separation regulator parts <input type="checkbox"/> Swivel problem
--	--	---	---

Miscellaneous Equipment (Check all that apply):

<p>Weights and weight belts:</p> <input type="checkbox"/> Overweight <input type="checkbox"/> Underweight <input type="checkbox"/> Unable to release <input type="checkbox"/> Didn't know how to release <input type="checkbox"/> Quick release jammed <input type="checkbox"/> Tongue overlap stopped release <input type="checkbox"/> Snagged during release <input type="checkbox"/> Weight belt /weights dropped <input type="checkbox"/> Snagged causing release <input type="checkbox"/> BCD integrated weight problem <p>Wet / dry suit: <input type="checkbox"/> Uncomfortable <input type="checkbox"/> Tight - restricted breathing <input type="checkbox"/> Changed buoyancy</p>	<p>Buoyancy Jacket (BCD):</p> <input type="checkbox"/> Unfamiliar with its use <input type="checkbox"/> Spontaneously inflated <input type="checkbox"/> Inflation device failed <input type="checkbox"/> Inflator hose leaked <input type="checkbox"/> Inflation device not connected <input type="checkbox"/> Incorrect inflator hose <input type="checkbox"/> Didn't know how to inflate BCD <input type="checkbox"/> Didn't know how to deflate vest <input type="checkbox"/> Inflator/octopus combination problem <input type="checkbox"/> Dump valve malfunction <input type="checkbox"/> Uncomfortable	<input type="checkbox"/> Inflated restricted breathing <input type="checkbox"/> Unable to deflate <input type="checkbox"/> BCD air cylinder problem <input type="checkbox"/> Unable to inflate <input type="checkbox"/> Unable to inflate due to low air <input type="checkbox"/> Provided inadequate buoyancy <input type="checkbox"/> Confusion deflate/inflate buttons <input type="checkbox"/> Buddy couldn't deflate vest <input type="checkbox"/> Buddy couldn't inflate vest <input type="checkbox"/> Leaked <input type="checkbox"/> Incorrect size <input type="checkbox"/> Other Specify :
<p>Mask</p> <input type="checkbox"/> Flooding/dislodged caused panic <input type="checkbox"/> Flooding/dislodged no panic <input type="checkbox"/> Strap broke <input type="checkbox"/> Unable to clear <input type="checkbox"/> Clearing caused panic <p>Dive tables</p> <input type="checkbox"/> Not used <input type="checkbox"/> Misread <input type="checkbox"/> Unable to understand	<p>Dive computer</p> <input type="checkbox"/> Not used <input type="checkbox"/> Inaccurate <input type="checkbox"/> Stopped working <input type="checkbox"/> Forgot to activate it <input type="checkbox"/> Unable to read/layout confusing <input type="checkbox"/> Battery problems <p>Fins</p> <input type="checkbox"/> Strap broke <input type="checkbox"/> Lost <input type="checkbox"/> Caused cramp <input type="checkbox"/> Incorrect size	<p>Depth gauge</p> <input type="checkbox"/> Not used <input type="checkbox"/> Inaccurate <input type="checkbox"/> Unable to read <input type="checkbox"/> Maxm depth indicator problem <input type="checkbox"/> Confusion units used <p>Tank/cylinder</p> <input type="checkbox"/> Out of test <input type="checkbox"/> Faulty <input type="checkbox"/> Changed buoyancy <input type="checkbox"/> Not secured in backpack <input type="checkbox"/> Size change between dives

Tank Configuration Used:

<p>SINGLE TANK</p> <input type="checkbox"/> Yes <p>Configuration not known <input type="checkbox"/></p>	<p>TWIN TANKS</p> <input type="checkbox"/> Independent back mounted <input type="checkbox"/> Independent side mounted <input type="checkbox"/> Manifolded (<input type="checkbox"/> isolator problem) <input type="checkbox"/> Not known	<p>SLING TANKS OR STAGES</p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not known <input type="checkbox"/> One <input type="checkbox"/> Two <input type="checkbox"/> Not known <p>Configuration and contents if known:</p>
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Report Prepared By:

Signature

Printed Name

Date

APPENDIX 8 DIVE COMPUTER GUIDELINES

1. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.
2. Any diver desiring the approval to use a dive computer as a means of determining decompression status must apply to the Diving and Boating Safety Committee, complete an appropriate practical training session and pass a written examination.
3. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have their own unit.
4. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.
5. If the dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.
6. A diver should not dive for 18 hours before activating a dive computer to use it to control their diving.
7. Once the dive computer is in use, it must not be switched off until it indicates complete out gassing has occurred or 18 hours have elapsed, whichever comes-first.
8. When using a dive computer, non emergency ascents are to be at a rate specified for the make and model of dive computer being used.
10. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.
11. Multiple deep dives require special consideration.

APPENDIX 9 AAUS STATISTICS COLLECTION CRITERIA AND DEFINITIONS

COLLECTION CRITERIA:

The “Dive Time in Minutes”, The Number of Dives Logged”, and the “Number of Divers Logging Dives” will be collected for the following categories.

- Dive Classification
- Breathing Gas
- Diving Mode
- Decompression Planning and Calculation Method
- Depth Ranges
- Specialized Environments
- Incident Types

Dive Time in Minutes is defined as the surface to surface time including any safety or required decompression stops.

A Dive is defined as a descent into water, an underwater diving activity utilizing compressed gas, an ascent/return to the surface, and a surface interval of greater than 10 minutes.

Dives will not be differentiated as open water or confined water dives. But open water and confined water dives will be logged and submitted for AAUS statistics classified as either scientific or training/proficiency.

A “Diver Logging a Dive” is defined as a person who is diving under the auspices of your scientific diving organization. Dives logged by divers from another AAUS Organization will be reported with the divers home organization. Only a diver who has actually logged a dive during the reporting period is counted under this category.

Incident(s) occurring during the collection cycle. Only incidents occurring during, or resulting from, a dive where the diver is breathing a compressed gas will be submitted to AAUS.

DEFINITIONS:

Dive Classification:

- Scientific Dives: Dives that meet the scientific diving exemption as defined in 29 CFR 1910.402. Diving tasks traditionally associated with a specific scientific discipline are considered a scientific dive. Construction and trouble-shooting tasks traditionally associated with commercial diving are not considered a scientific dive.
- Training and Proficiency Dives: Dives performed as part of a scientific diver training program, or dives performed in maintenance of a scientific diving certification/authorization.

Breathing Gas:

- Air: Dives where the bottom gas used for the dive is air.
- Nitrox: Dives where the bottom gas used for the dive is a combination of nitrogen and oxygen other than air.
- Mixed Gas: Dives where the bottom gas used for the dive is a combination of oxygen, nitrogen, and helium (or other “exotic” gas), or any other breathing gas combination not classified as air or nitrox.

Diving Mode:

- Open Circuit Scuba: Dives where the breathing gas is inhaled from a self contained underwater breathing apparatus and all of the exhaled gas leaves the breathing loop.
- Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the divers' depth, time and diving profile.
- Hookah: While similar to Surface Supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for monitoring their own depth, time, and diving profile.
- Rebreathers: Dives where the breathing gas is repeatedly recycled in the breathing loop. The breathing loop may be fully closed or semi-closed. Note: A rebreather dive ending in an open circuit bailout is still logged as a rebreather dive.

Decompression Planning and Calculation Method:

- Dive Tables
- Dive Computer
- PC Based Decompression Software

Depth Ranges:

Depth ranges for sorting logged dives are 0-30, 31-60, 61-100, 101-130, 131-150, 151-190, and 191->. Depths are in feet seawater. A dive is logged to the maximum depth reached during the dive. Note: Only "The Number of Dives Logged" and "The Number of Divers Logging Dives" will be collected for this category.

Specialized Environments:

- Required Decompression: Any dive where the diver exceeds the no-decompression limit of the decompression planning method being employed.
- Overhead Environments: Any dive where the diver does not have direct access to the surface due to a physical obstruction.
- Blue Water Diving: Open water diving where the bottom is generally greater than 200 feet deep and requiring the use of multiple-tethered diving techniques.
- Ice and Polar Diving: Any dive conducted under ice or in polar conditions. Note: An Ice Dive would also be classified as an Overhead Environment dive.
- Saturation Diving: Excursion dives conducted as part of a saturation mission are to be logged by "classification", "mode", "gas", etc. The "surface" for these excursions is defined as leaving and surfacing within the Habitat. Time spent within the Habitat or chamber shall not be logged by AAUS.

- Aquarium: An aquarium is a shallow, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research. (Not a swimming pool)

Incident Types:

- Hyperbaric: Decompression Sickness, AGE, or other barotraumas requiring recompression therapy.
- Barotrauma: Barotrauma requiring medical attention from a physician or medical facility, but not requiring recompression therapy.
- Injury: Any non-barotrauma injury occurring during a dive that requires medical attention from a physician or medical facility.
- Illness: Any illness requiring medical attention that can be attributed to diving.
- Near Drowning/ Hypoxia: An incident where a person asphyxiates to the minimum point of unconsciousness during a dive involving a compressed gas. But the person recovers.
- Hyperoxic/Oxygen Toxicity: An incident that can be attributed to the diver being exposed to too high a partial pressure of oxygen.
- Hypercapnea: An incident that can be attributed to the diver being exposed to an excess of carbon dioxide.
- Fatality: Any death accruing during a dive or resulting from the diving exposure.
- Other: An incident that does not fit one of the listed incident types

Incident Classification Rating Scale:

- Minor: Injuries that the OM considers being minor in nature. Examples of this classification of incident would include, but not be limited to:
 - Mask squeeze that produced discoloration of the eyes.
 - Lacerations requiring medical attention but not involving moderate or severe bleeding.
 - Other injuries that would not be expected to produce long term adverse effects on the diver's health or diving status.
- Moderate: Injuries that the OM considers being moderate in nature. Examples of this classification would include, but not be limited to:
 - DCS symptoms that resolved with the administration of oxygen, hyperbaric treatment given as a precaution.
 - DCS symptoms resolved with the first hyperbaric treatment.
 - Broken bones.
 - Torn ligaments or cartilage.
 - Concussion.
 - Ear barotraumas requiring surgical repair.
- Serious: Injuries that the OM considers being serious in nature. Examples of this classification would include, but not be limited to:
 - Arterial Gas Embolism.
 - DCS symptoms requiring multiple hyperbaric treatment.
 - Near drowning.
 - Oxygen Toxicity.
 - Hypercapnea.
 - Spinal injuries.
 - Heart attack.
 - Fatality.

APPENDIX A BLANK

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APPENDIX B RELEASE AND WAIVER OF LIABILITY

FAU Diving and Boating Safety Program Release and Waiver of Liability

READ THIS DOCUMENT COMPLETELY BEFORE SIGNING.

In consideration of the permission granted to Releasor (named below) by the Florida Atlantic University Board of Trustees (FAU) to participate in certain activities which shall consist, in whole or in part, of diving, both SCUBA and snorkeling, or boating commencing on the date this document is executed, the receipt of which permission is hereby acknowledged, Releasor, for himself/herself and his/her personal representatives, heirs, next of kin, executors, administrators and assigns, hereby forever releases, holds harmless, waives, discharges and covenants not to sue the Florida Atlantic University Board of Trustees the State of Florida, and their respective trustees, officers, agents, employees, and volunteers (hereinafter referred to as "Releasee"), from any and all actions, causes of action, damages, claims, demands or liabilities, either in law or in equity, arising from or by reason of any bodily injury or personal injuries known or unknown, including death, and any property damage, either known or unknown, which may occur as a result of or in connection with Releasor's participation in these activities, whether caused by the negligence of Releasees or otherwise.

Releasor hereby acknowledges that he/she has been fully advised of and has actual knowledge and conscious appreciation of the particular risks and dangers involved in these activities including, but not limited to, those risks and dangers involved in traveling to locations, being around and learning to use scientific equipment, spending periods exposed to the sun and weather, possibly voyaging upon vessels with its concomitant risks of motion sickness and grounding, diving with SCUBA equipment, and all other risks and dangers naturally inherent in boating, diving, snorkeling and swimming activities, and Releasor hereby acknowledges that he/she elects voluntarily to fully assume all such risks and confront all such dangers and to release and hold harmless Releasees as stated above.

Releasor represents that he/she has no health-related problems or conditions which preclude his/her participation in these activities. Releasor further represents that he/she has adequate health insurance, or other financial capability, necessary to provide for and pay any non-employment related medical costs that may directly or indirectly result from his/her participation in these activities. Notwithstanding anything herein to the contrary, with respect to FAU employees, nothing here shall waive or release the Releasor's rights to any workers compensation benefits, as applicable.

Releasor further understands that Releasees may record and/or photograph Releasor with a camera or other photographic, recording or electronic medium and consents to the use, publication or display of any such recordings for any promotional or educational purpose. Releasor waives all claims for compensation, liability or damage relating to any such use.

This document is governed by the laws of the State of Florida. Releasor expressly agrees that this document is intended to be as broad and inclusive as permitted by the law. Releasor hereby represents and warrants that he/she has carefully read this agreement and the FAU Diving and Boating Safety Manual, and agrees to abide by all standards therein. Releasor hereby represents and warrants that he/she is at least 18 years of age.

I HAVE READ THIS AGREEMENT, UNDERSTAND THAT I AM GIVING UP SUBSTANTIAL RIGHTS BY SIGNING IT, AND VOLUNTARILY AGREE TO BE BOUND BY IT.

IF I AM AN FAU EMPLOYEE OR VOLUNTEER ACTING WITHIN THE COURSE AND SCOPE OF MY EMPLOYMENT OR VOLUNTEER RESPONSIBILITIES, MY RIGHTS WILL REMAIN PRESERVED.

Dated this _____ day of _____, 201__.

Name of "Releasor"

Releasor's Signature
(I certify that I am 18 years of age or older)

APPENDIX C FAU SCIENTIFIC DIVING PROGRAM DIVER APPLICATION FORM

Name:	Date of Birth: / /	Sex: M F
Campus:	Department:	
Home Phone: () Office:	Email:	
Are you currently scuba certified? Y N Certification organization? _____	Date of last physical? _____	
Diving Plans: Project and department with which you will be diving at FAU: _____ _____ _____		
Home Address: Street: _____ City: _____ Apt. No: _____ Zip: _____		
Emergency Contact Information: Name: _____ Relationship: _____ Street: _____ City: _____ State _____ Home Telephone: () _____ - _____ Work Phone: () _____ - _____		
I wish to apply for entry into the Florida Atlantic University Scientific Diving Program. I agree to abide by the policies of the FAU Scientific Diving Control Board and to adhere to their policies and procedures concerning all scientific diving activities. Mail completed form to EH&S or fax to: (561) 297-2210.		
_____ Printed name		_____ Date
_____ Signature		

Personal Diving Experience

DIVE TRAINING:

Level	Certifying Agency	Location	Total Hours			Date of Completion	Instructor name and # if known
			Lecture	Pool	Water		

OTHER RELATED TRAINING:

Date of Completion and Organization	
CPR	Water Safety Instructor
First Aid	Life Guard
EMT, DMT, or Paramedic	Swimming
Chamber Operator	CG Aux. Boating
Dive Accident Management	Oxygen First Aid

Brief description of other diving training (military, commercial, scientific, public safety): _____

EXPERIENCE:

Total Number of Dives _____ Total Bottom Time _____
 Maximum Depth _____ Date of Last Dive _____
 Number of Dives (last year) _____ Maximum Depth (last year) _____

Indicate number of dives for each depth category and depth range that you have completed:

Equipment	0-30'	31'-60'	61'-100'	101'-130'	131'-150'	151'-190'	>190'
Scuba							
Decompression Scuba							
Mixed Gas							
Surface Supply							
Closed Circuit							
Lock-out or Bell							
Saturation							
Hard Hat							
Dry Suit							
Nitrox							

Indicate with appropriate letter your degree of experience diving in the following conditions:

E = Extensive (>20 times)
M = Moderate (5-20 times)

L = Limited (1-4 times)
_ = Leave blank if no experience

- _____ Small Boat
- _____ Ship
- _____ Beach
- _____ Rocky Shore
- _____ Heavy Surf
- _____ Current (>1/2 knot)
- _____ Ice
- _____ Cave
- _____ Wreck
- _____ Night
- _____ Altitude (>2000')

- _____ Blue Water
- _____ Cold Water (<45°F)
- _____ Turbid (<3' visibility)
- _____ Fresh Water
- _____ River
- _____ Ocean
- _____ Mud/Silt Bottom
- _____ Kelp Forest
- _____ Coral reef
- _____ Vertical Wall
- _____ Blue Hole

List geographical areas that you have dived: _____

Have you experienced nitrogen narcosis? _____ What depth? _____

Have you experienced any diving related injury? _____

Briefly describe each incident _____

Have you ever been treated in a recompression chamber? _____ What depth? _____

Indicate date, place, and physician _____

STATEMENT

I certify that the above information is correct. I agree to follow the safety regulations of the FAU "Diving and Boating Safety Manual" and to abide by whatever limitation and restriction may be imposed by FAU diving officials.

Print Name

Date

Signature



APPENDIX D FAU FLOAT PLAN

Please submit float plan to Diving Boating Coordinator (DBC) or Designee via email or fax.

Operations Plan:

Principal Investigator/Supervisor: _____ Index/Grant No: _____

Primary Vessel Operator: _____ Alternate Vessel Operator: _____

Crew/Passengers: _____

Purpose: _____

Date of Operation: _____ Expected Departure _____ Expected Return _____ / _____ Initiate Search _____
Time: _____ Date/Time: _____ Time: _____

Route: _____

Operational Area/Station: _____

Special Equipment Required: _____

Vessel and Towing Vehicle Details:

Vessel Name: _____ Length: _____ ft. FL Numbers: _____ Hull Color: _____

No. Engines: _____ Inboard/Outboard: _____ Est. Range: _____ miles Point of Departure: _____

Towing Vehicle Make/Model: _____ Tag: _____ Color: _____ Trailer Tag: _____

Communication Plan:

Primary Vessel Contact Cell: _____ Alt. Vessel Contact Phone No.: _____ Radio Ch. _____

Communication Schedule: 2 hours _____ 4 hours _____ Other _____

Primary Shore Contact: _____ Phone No: _____

In the event of missed check-in, Shore Contact should contact the Boating Safety Officer at 561-239-4293 or 772-766-1159. For local incident/accidents contact USCG Rescue Coordination Center Miami at 305-415-6800 or, Everglades NPS 24-hour Search and Rescue at 305-247-7272 or, FWC at 888-404-3922, or CG Channel 16.

Approvals:

Principal Investigator/Supervisor Date DBC or Designee Date

Will this outing involve any diving? _____ snorkeling? _____

If so a dive plan must be filed with the Diving and Boating Coordinator or Designee.

VESSEL SAFETY CHECKLIST: STANDARD BOATS

Vessel Name: _____ Vessel Number: _____

Operator or Captain: _____ Date: _____

Equipment Checklist - Required

- Float plan submitted**
- Boater education card
- Boat registration
- Compass and GPS
- Up to date charts of area
- PFD's- life jacket suitable for each person on board, readily accessible, in good condition and Coast Guard approved
- Throwable floatation aid immediately available
- Fire extinguisher properly mounted, fully charged, and in good condition
- Visual distress signals- current dates on flares, proper amount required
- Working horn or whistle
- First aid kit, Dan oxygen kit (required when diving)
- Anchors and line- adequate anchor for bottom and water depth
- Dewatering device- bilge pump operational, alternative bailing device available
- Alternate propulsion – paddles or oars
- Mooring lines and fenders in good condition
- VHF radio and cell phone
- Depth sounder, lead line, or sounding pole

Equipment Checklist - Recommended

- Tool kit and spare parts
- Flashlight
- Personal items- drinking water, sunscreen, prescription drugs, etc
- Boarding ladder (or other means of boarding)

Vessel System Checklist

- Drain plug installed
- Fuel tank full
- Bilge free of water
- Engine oil level correct (4 stroke engine), oil tank full (2 stroke engine)
- Turn on battery switch if one is installed
- Battery fully charged
- Navigational gear operational
- Navigation lights working
- Steering and shift mechanisms in good condition
- Gauges- functional and reading properly
- Ventilation- power ventilation operable (blower) and natural ventilation cowls open and clear
- Bilge pump switch on auto
- VHF radio and antenna is operational (put radio on channel 16 and call for a radio check)

VESSEL SAFETY CHECKLIST: AIRBOATS

Vessel Name: _____ Vessel Number: _____

Operator or Captain: _____ Date: _____

Daily Check-off

- Radio/Cellular phone
- Boat and trailer lights
- First aid kit
- Air horn
- Fire extinguisher
- Personal floatation devices
- Hearing and eye protection
- At least one gallon of water per passenger
- Strobe light, navigation lights and red flags
- Propeller and propeller area
- Rudders
- Paddies and/push poles
- Jumper cables
- Anchor and rope
- Oil level
- Hydraulic level
- Wheel bearings
- Battery
- Drain plugs
- Gas level
- Extra gas
- Extra oil
- Trailer hitch and safety chains
- Jack and lug wrench

VESSEL SAFETY DEPARTURE CHECKLIST: ALL BOATS

- Make sure each person has a properly fitted PFD and urge them to wear it. Youth 12 and under are required to wear a PFD
- Show everyone location of PFD's, fire extinguisher(s), visual distress signals, first aid kit, DAN O2 kit, and how to use them
- Safety procedures for rough weather, man overboard, fire, and how to use VHF radio to signal for help
- Take in all dock lines and fenders and keep them clear of propeller
- Instruct everyone to stay seated and keep hands, arms, etc., inside the boat
- Keep a lookout at all times for other boats, persons, and objects in water
- Proceed slowly whenever leaving or returning to a dock
- Know and abide by Manatee zones, and all no wake zones
- Stay in channel when running

Post-use Checklist

- Re-fuel boat
- Wash / rinse boat and all gear
- Pump bilge dry
- Flush outboard motor(s)
- Turn off battery switch
- Rinse off trailer
- Report all safety, mechanical, electrical, cosmetic, or trailer problems with vessel supervisor.

Comments or irregularities



APPENDIX E DIVE PLAN FORM

Florida Atlantic University
Diving Safety Program

FOR EH&S USE ONLY

Date Submitted: _____

Grant/ Project#: _____

DIVE PLAN SUBMISSION FORM

DSO Signature _____

Proposed Expedition Dates: _____ through _____

General Dive Site Location: _____

Dive Plan Submitted By: _____

Principal Investigator: _____ Lead Diver: _____

Is this Dive Plan in Support of a Grant: _____ Grant No.: _____

Proposed No. of Dives: _____
(Profile each dive if different)

Proposed No. of Divers: _____
(List each diver on info. Sheet)

Will this Plan Involve:

- | | |
|--|---|
| <input type="checkbox"/> Boats or larger vessels | <input type="checkbox"/> Flying after diving |
| <input type="checkbox"/> Multiple days of diving | <input type="checkbox"/> International travel |
| <input type="checkbox"/> Decompression diving | <input type="checkbox"/> Non-FAU personnel |
| <input type="checkbox"/> Specialty diving | |

General Dive Plan Considerations

- Any diver has the right to refuse to dive without fear of penalty if s/he feels the conditions are unsafe or unfavorable **OR** the dive violates the precepts of their training **OR** the regulations of the FAU Diving Safety Program.
- It is the responsibility of each diver to terminate the dive, without fear of penalty, whenever s/he feels it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.
- All Dive plans **MUST** be based on the competency of the least experienced diver.
- All Divers-in-training must be buddied with a Scientific Diver.
- **Absolutely No Solo Diving is allowed.**
- Depth certification levels may be extended only to the next deepest certification level and only if the diver with the limiting depth certification level is buddied with a diver certified to the deeper depth level.
- For all diving conducted under hazardous conditions a plan must be formulated to deal with such conditions.
- A Dive Profile **MUST** be completed for each proposed dive.(copy forms as needed)
- If dives are to be conducted from vessels, a Float Plan must also be completed.

An Emergency Plan **MUST** be completed for each expedition including the following: emergency contact information (including name, relation and telephone number) for each diver, nearest recompression chamber, nearest accessible hospital and anticipated means of transportation.

DIVE PLAN

Diving Roster
Name

Level

Depth Certification

1.	_____	Lead Diver-Scientific Diver	_____ fsw
2.	_____	_____	_____ fsw
3.	_____	_____	_____ fsw
4.	_____	_____	_____ fsw
5.	_____	_____	_____ fsw
6.	_____	_____	_____ fsw
7.	_____	_____	_____ fsw
8.	_____	_____	_____ fsw
9.	_____	_____	_____ fsw
10.	_____	_____	_____ fsw

Any Non-FAU Personnel: _____
(include parent organization or auspices)

Purpose of Dives: _____

Operational Plan

Maximum Depth: _____ ft **Number of dives/diver/day:** _____

Dive Tables and/or dive computers to be used: _____

Decompression schedules and repetitive dive plans: _____
(use dive profile worksheet for detailed plan)

Diving work plans: _____
(attach detailed explanation if necessary)

Specialty dives if planned: _____
(see DBSM Section 11.00)

Nitrox, or mixed gases: _____
(include percentages)

Tools or Specialized Equipment Used: _____
(diving sleds, scooters, drills, surface supply, hookah, tethers, etc.)

Dive Site

Name of Boat or Vessel: _____ **Reg. #:** _____
 FAU Charter Personnel Other

Beach or Other Site: _____

Safety Considerations

Any Hazardous Conditions Anticipated: _____
(ie: Cold water, night diving, extreme currents, extreme depths)

Safety Precautions: (ie: Chase vessel, dry suits) _____

- First-Aid Kit
- Emergency Oxygen Resuscitator _____
- Dive flag _____

International Travel

Contacts in country: _____
(include name and phone number)

U. S. Consulate or Embassy: _____
(include phone, fax, address)

For International Travel: Attach a copy of all itineraries including flight times and accommodations with contact information which will be utilized.

DIVE PROFILE WORKSHEET

Date: _____

Location: _____

Dive No.: _____

Note: Use one sheet per dive profile.

Lead Diver : _____

Buddy Team 1: _____ & _____

Buddy Team 2: _____ & _____

Buddy Team 3: _____ & _____

Buddy Team 4: _____ & _____

Buddy Team 5: _____ & _____

Weather: _____
 Seas: _____
 Current: _____
 Visibility: _____
 Temperature: _____
 Substrate: _____

SI=____ RG ____ RG ____

_____ | _____ | _____
 | Safety stop _____ min

Depth _____ |
 No-D _____ |

Gas used: Limit _____ Time in: _____

Air RNT= _____ Time out: _____

Nitrox _____ % O2 BT= _____

Water Temp _____

TBT/EBT= _____

Multi-level			
DEPTH FT			
NO-D LIMIT MIN.			
BOTTOM TIME MIN.			
EFFECTIVE B.T. MIN.			
REPETITIVE GROUP			
DECOMPRESSION DEPTH	30 ft	20 ft	10 ft
DECOMPRESSION TIME			

TBT/EBT = BT + RESIDUAL NITROGEN TIME
 = BT X RF (DCIEM)

Multi-level EBT = BT + RAT

If any Multi-level TBT/EBT equals the No-D limits, a 5 minute safety stop at 10 feet is required.

Safety Dive Profile Planning

Use this table to plan contingency depths and times in the event planned depth or planned time profiles are exceeded.

PLANNED DEPTH (PD)	NO - D LIMIT	PT + 5MIN	NEW EBT	DECOMPRESSION TIME(S)		
				30'	20'	10'
PD + 10 ft.						
PD + 20 ft.						

* Multi-level dive planning-substitute 2nd and 3rd depth for PD+10 and PD+20, respectively.

*** USE ADDITIONAL SHEETS AS NEEDED ***

LEAD DIVER CHECKSHEET

(complete prior to departing to dive site)

It is the responsibility of the Lead Diver to assure that each of the following items has been checked and that all divers have all required gear.

Administrative

- Dive Plan Signed by DSO
- Emergency Response Plan Completed
- Dive Tables Available
- Float Plan if Diving from Vessel

Dive Support

- First Aid Kit
- Oxygen Resuscitator
- Dive Flag
- Radio or Cell Phone
- Down Line
- Tag Line and Float

All Divers Have:

- Regulator
- Octopus Regulator
- High Pressure Gauge
- Depth Gauge
- Mask
- Fins
- Snorkel
- Buoyancy Compensator
- Scuba Tank
- Scuba Tank Backpack
- Knife
- Weights and/or Weight Belt
- Compass
- Whistle
- Inflatable Emergency Tube (Diver's Sausage)

Comments:

Lead Diver Print Name

Date

Signature

DIVING ACCIDENT EMERGENCY MANAGEMENT PLAN

A diving accident victim is any person who has been breathing air underwater regardless of depth. It is essential that emergency procedures are pre-planned and that medical treatment is initiated as soon as possible. It is the responsibility of the expedition's Dive master to develop procedures for such emergencies including evacuation and medical treatment for each dive location.

General Procedures:

Depending on and according to the nature of the diving accident, stabilize the patient, administer 100% oxygen, and initiate the local Emergency Medical System (EMS) for transport to nearest medical facility. Explain the circumstances of the dive incident to the evacuation team, medics and physicians. Do NOT assume that they understand why 100% Oxygen may be required for the diving accident victim or that recompression treatment may be necessary. If time allows, complete some or of the CALL-IN DATA SHEET.

- 1. Rescue victim and/or position so the proper procedures may be initiated.**
- 2. Establish (A)irway, (B)reathing and (C)irculation as required.**
- 3. Administer 100% oxygen, if appropriate (in cases of Decompression Illness or Near Drowning).**
- 4. Activate the local EMS for transport to the nearest appropriate medical facility. (the local EMS will vary from site to site – it must be stated in dive plan)**
- 5. Contact the Diver's Alert Network as deemed necessary.**
- 6. Contact Diving Safety Officer (DSO) and Emergency Contact Person, as deemed necessary.**
- 7. Complete and submit Incident Report Form (in manual) to DSO.**

Expedition Emergency Contact Numbers:

- United States Coast Guard – Channel 16 on Marine VHF Radio
- Local EMS telephone number - _____
(Appendix 7)

Nearest Medical Treatment Facility to Dive Site:

- Location: _____
- Telephone: _____
(Appendix 7)

Nearest Recompression Facility to Dive Site:

- Location: _____
- Telephone: _____
(Appendix 7)

Diver's Alert Network (DAN):

- **1-919-684-9111 or 1-800-446-2671**

24 hour medical advise—if necessary call collect and state “I have a Medical Emergency”—Use to locate closest recompression chamber or physician consultations.

EMERGENCY CONTACT INFORMATION FOR EACH DIVER

Diver: _____

Emergency Contact: _____ Relation: _____

Work Telephone: _____ Home Telephone: _____

Street Address: _____

City: _____ State: _____ Zip: _____

.....

Diver: _____

Emergency Contact: _____ Relation: _____

Work Telephone: _____ Home Telephone: _____

Street Address: _____

City: _____ State: _____ Zip: _____

.....

Diver: _____

Emergency Contact: _____ Relation: _____

Work Telephone: _____ Home Telephone: _____

Street Address: _____

City: _____ State: _____ Zip: _____

.....

Diver: _____

Emergency Contact: _____ Relation: _____

Work Telephone: _____ Home Telephone: _____

Street Address: _____

City: _____ State: _____ Zip: _____

*** USE ADDITIONAL SHEETS AS NEEDED ***

DIVE PLAN APPROVAL

I certify that this dive plan has been completed in compliance with the Florida Atlantic University Diving/ Boating Safety Subcommittee policies and procedures as well as 29 CFR 1910.401. I further certify that all information provided in this plan is true and correct to the best of my knowledge.

All dive plans should be returned to the Diving Safety Officer, or designee within one week following completion of the planned dives(s).

Principle Investigator: _____
(Print Name)

(Signature) _____ (Date) _____

Dive Team Leader: _____
(Print Name)

(Signature) _____ (Date) _____

For EH&S Use Only

Dive Plan reviewed by: _____ (print name) _____ (title)

Approved: Yes No Date: _____

(Signature)

APPENDIX G FAU SCIENTIFIC DIVER TRAINING COURSE

Name of Applicant:						Start Date:					
Date						Pool					
	Application to Diving Program						Swim Test				
	Liability Waiver						Swim Strokes				
	Statement of Gear Understanding						Snorkel Skills				
	Diving Physical						Self-rescue				
	CPR/First-Aid						Tows and Assists				
	DAN O2 Oxygen First-Aid						Rescue Skills				
	Gear Inspections						Carry's and Water Removals				
	Date of Scuba Certification						Basic Scuba Skills				
Academic Topics							Diver Assists and Tows				
	History of Scientific Diving						Rescue Skills				
	Diving Safety						Knot Tying				
	Rescue Diving						Gear Clip-on				
	HazMat Diving						Lift Bag Usage				
	Hazardous Materials						Wreck and finger Reel Usage				
	Test Score:						Transect/quadrats				
	FAU Diving and Boating Manual						Underwater Construction				
	Dive Hand Signals						Zero Visibility Swim				
	Test Score:						Full face masks and comms				
	Scientific Diving Methodology						Technical gear assembly and use				
	General Decompression Rules					O/W Rescue Evaluation/Checkout Dive					
	Dive Tables						Compass Usage				
	Dive Computers						Search and Recovery				
	Test Score:						Rescue Unconscious Diver				
	Diving Physiology						Strip Gear				
	Diving Accident Management						Assess				
	First-aid for Diving Injuries						Activate EMS				
	Hazardous Aquatic Animals						CPR/First Aid				
	Test Score:						O2 First-Aid				
	Dive Physics										
	Equipment										
	Diving from Boats						Checkout Dive				
	Test Score:										
Cumulative Exam Score							Completion Date				
	Score:						Scientific Diving Certificate Issued				
Training Dive	2	3	4	5	6	7	8	9	10	11	12
Date											

Diving Safety Officer _____

Date _____

APPENDIX H FAU CHECKOUT DIVE PROCEDURE

Anyone diving under the auspices of FAU may be required, at the discretion of the DSO, to demonstrate proficiency in some or all of the following skills. If proficiency cannot be demonstrated, remedial training may be required before permission is granted to dive under FAU auspices.

Name of Applicant:		
Date	DSO <i>initials</i>	Requirement/Skill
		Knowledge of FAU and AAUS diving standards and regulations
		Swim skills (Optional if evaluation is needed):
		Surface dive to 10 ft. without scuba gear
		Surface swim without swim aids (400 yd. <12min)
		Underwater swim without swim aids (25 yd. without surfacing)
		Tread water, swim aids (10 min.), or without use of hands 2 min.
		Transport another swimmer without swim aids (25yd)
		Demonstrate watermanship and snorkel skills
		Pre-dive Skills
		Dive planning, briefing, site orientation, and buddy check
		Use of dive tables and/or dive computer
		Equipment familiarity
		Entries (pool, boat, shore)
		Dive Skills
		Mask removal and clearing
		Regulator removal and clearing
		Surface swim with scuba; snorkel and regulator exchange (400 yd.)
		Neutral buoyancy (hover motionless in midwater)
		Proper descent and ascent with B.C.
		Remove and replace weight belt while submerged
		Remove and replace scuba cylinder while submerged
		Simulated decompression or safety stop
		Compass and underwater navigation
		Exits (pool, boat, shore)
		Situational Awareness
		Underwater signs and signals
		Proper buddy contact
		Monitor cylinder pressure, depth, bottom time
		Rescue Skills
		Self-rescue techniques
		Alternate air source breathing with and without mask (donor/receiver)
		Buddy breathing with and without mask (donor/receiver)
		Tows of conscious and unconscious victim
		Simulated in-water rescue breathing
		Rescue of submerged non-breathing
		Rescue breathing
		Diver equipment removal
		Recovery to boat or shore)

		Accident Management
		EMS Activation
		Search and recovery
		CPR/First-Aid
		Use of emergency oxygen on breathing and non-breathing victim
		Evacuation procedures

Diving Safety Officer _____

Date _____

APPENDIX I DIVER'S FIRST AID KIT CHECKLIST

<input type="checkbox"/> 1" Adhesive Bandages (Band-aids)	30
<input type="checkbox"/> Butterfly Bandages	10
<input type="checkbox"/> Steri-pads, small	10
<input type="checkbox"/> Steri-pads, medium	10
<input type="checkbox"/> 2" x 126" (3.5 yd) Red Cross Bandage	1
<input type="checkbox"/> 4" x 126" (3.5 yd) Red Cross Bandage	1
<input type="checkbox"/> ½" x 180" (5 yd) First Aid Tape	1
<input type="checkbox"/> 1" x 180" (5 yd) First Aid Tape	1
<input type="checkbox"/> Triangular Bandage	2
<input type="checkbox"/> Ace Bandage	Optional
<input type="checkbox"/> Multi-Trauma Bandage	1
<input type="checkbox"/> Adaptic Non-adhering Dressing	2
<input type="checkbox"/> Ammonia Inhalants	1 box
<input type="checkbox"/> Cleansing Wipes	10
<input type="checkbox"/> Betadine Ointment or Solution	1 tube or bottle
<input type="checkbox"/> Cortisone Ointment	1 tube
<input type="checkbox"/> Neosporin Ointment	1 tube
<input type="checkbox"/> Aspirin	1 bottle
<input type="checkbox"/> Tylenol	1 bottle
<input type="checkbox"/> Sudafed	1 box
<input type="checkbox"/> Sea-sickness Pills	1 box
<input type="checkbox"/> Eye-Irrigating Solution	1 bottle
<input type="checkbox"/> Diluted Vinegar Solution	1 bottle
<input type="checkbox"/> Alcohol	1 bottle
<input type="checkbox"/> Cold Packs	2
<input type="checkbox"/> Hot Packs	2
<input type="checkbox"/> Bandage Scissors	1
<input type="checkbox"/> Pen Light	1
<input type="checkbox"/> Tweezers	1
<input type="checkbox"/> Tongue Depressors	1 box
<input type="checkbox"/> Oral Thermometer	1
<input type="checkbox"/> Oxygen Resuscitator (free-flow and demand)	1
<input type="checkbox"/> Pocket Mask with O ₂ Fitting	1
<input type="checkbox"/> Space Blanket	1
<input type="checkbox"/> Stethoscope	Optional
<input type="checkbox"/> Blood Pressure Kit	Optional
<input type="checkbox"/> First Aid Book	1
<input type="checkbox"/> FAU "Diving and Boating Safety Manual"	1
<input type="checkbox"/> Emergency Phone Numbers List	1

APPENDIX J FAU STANDARDS FOR COMMERCIAL DIVING

Introduction

In 1982, OSHA exempted scientific diving from commercial diving regulations (OSHA 29 CFR Part 1910, Subpart T) under certain conditions which are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). Sections 1.2 and 1.3 below define the differences between commercial and scientific diving activities. All diving activities conducted by FAU (Florida Atlantic University divers or under the auspices of Florida Atlantic University shall adhere to the OSHA Commercial Diving Operations Standards (29 CFR 1910.401 through 1910.440) unless qualified for the scientific diving or recreational diving exemptions explained below.

Scientific Diving Definition

Scientific diving is defined (OSHA 29 CFR 1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

Scientific Diving Exemption

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to Subpart T):

1. The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
4. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.

Commercial Diving Definition

The OSHA Commercial Diving Operations Standards (OSHA 29 CFR 1910.401- 1910.440) applies to diving and related support operations conducted in connection with all types of work and employments, including general industry, construction, ship repairing, shipbuilding, shipbreaking, and longshoring. However, this standard does not apply to any diving operations: 1) performed solely for instructional purposes, using open circuit, compressed air scuba and conducted within the no-decompression limits; 2) performed solely for search, rescue, or related public safety purposes; or 3) defined as scientific diving as described above in Sections 1.2 and 1.3.

Operational Control

The Diving and Boating Safety Committee has autonomous and absolute authority over the FAU diving program. This includes operational authority of any diving activities (by employees, volunteers, students, visitors, contractors, etc.) in which FAU is connected including any of the following: diving on any FAU related projects, using any FAU equipment, diving from FAU vessels or small boats, or diving within the scope of employment. The FAU Diving and Boating Safety Committee shall set forth, review, revise and administer these diving standards. The FAU Diving Safety Officer (DSO) shall have operational authority through the auspices of the FAU Diving and Boating Safety Committee.

- a) Contracted Commercial Divers – Non-FAU commercial divers diving under FAU auspices whether contracted or otherwise must submit the following minimum requirements to the FAU DBSC and the University Risk Management attorney for evaluation. Additional requirements may be imposed by the DBSC.
 1. A Contractor’s License valid in the State of Florida.
 2. Proof of adequate liability insurance.
 3. A dive plan for the proposed activities.

Personnel Requirements

For all commercial diving activities that are under the auspices of FAU, the commercial dive team members shall be qualified in accordance with OSHA 29 CFR 1910.410 and also in accordance with FAU’s “Diving and Boating Safety Manual.”

Operational Procedures, Specific Operations Procedures, Equipment Procedures, and Recordkeeping

The commercial divers when diving under the auspices of FAU shall adhere to the OSHA Commercial Diving Operations Standards (OSHA 29 CFR 1910.401- 1910.440). In addition, each dive team member shall comply with the FAU’s “Diving and Boating Safety Manual.” The OSHA diving standards in any case will supersede the HB diving standards where there is any discrepancy. At a minimum the dive team shall consist of two buddy divers and a standby diver.

Commercial Diving Operations Standards (OSHA 29 CFR 1910.401 through 1910.440)

The most current copy of OSHA 29 CFR 1910 Subpart T, Appendices A, B, and C can be found at the U.S. Government Printing Office website under the Code of Federal Regulations, and is updated daily.

<http://www.gpoaccess.gov/>

APPENDIX K FAU DBSC APPROVED DIVING EQUIPMENT

In accordance with the American Academy of Underwater Sciences' (AAUS) "Standards for Scientific Diving," the FAU Diving and Boating Safety Committee is required to specifically approve regulators, dive tables and dive computers used by members of the FAU scientific diving program. Additionally, the AAUS Standards also state that divers must use "approved" depth gauges. (*Reference: Section 3.20, AAUS Standards for Scientific Diving*)

Regulators

The FAU Diving and Boating Safety Committee specifically approves the use of all commercially available diving regulators, provided the following conditions are met.

1. The diver purchased the regulator "new" from a commercial outlet.
2. If the diver purchased the regulator "used" from a commercial or private entity, the regulator has been serviced by a certified technician and approved by the FAU Diving Safety Officer.
3. The regulator is inspected and tested prior to first use and every 12 months thereafter.
4. Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or redundant air supply).
5. The regulator is not subject to a manufacturer's or a Consumer Product Safety Commission's recall. (See www.cpsc.gov search term "SCUBA dive" or "manufacturer's name")

Dive Tables and Dive Computers

The FAU Diving and Boating Safety Committee specifically approves the use of the following dive tables and computers.

1. Navy, NAUI, NOAA, PADI, and SSI non-decompression dive tables.
2. Other dive tables as approved by the DSO.
3. Dive computers from the following manufacturers:
Aeris, AquaLung, Cressi-Sub, Cochran, Mares, Oceanic, and Uwatek,
provided the specific model is not subject to a manufacturer's or a Consumer Product Safety Commission's recall:
4. Dive computers from manufacturers other than those listed above must be approved by the DSO.

Depth Gauges

The FAU Diving and Boating Safety Committee specifically approves the use of all commercially available depth gauges, provided the following conditions are met.

1. The diver purchased the depth gauge "new" from a commercial outlet.
2. If the diver purchased the depth gauge "used" from a commercial or private entity, the depth gauge has been inspected and approved by the FAU Diving Safety Officer.
3. The depth gauge must be tested at depth against a gauge(s) that is(are) known to be working prior to being placed in service and every 12 months thereafter.
4. The depth gauge is not subject to a manufacturer's or a Consumer Product Safety Commission's recall. (See www.cpsc.gov search term "SCUBA dive" or "manufacturers name")

Diver's Equipment Inspection Requirements

Divers must ensure that the following equipment is inspected by a qualified technician at these minimum intervals and that service records are forwarded to the DSO. However, divers must also forward copies of service records for any other diving equipment modification, repair, test, calibration, or maintenance service performed to the DSO for inclusion in the diver's file.

Regulators: Inspected and Serviced – 12 months

Buoyancy Compensating Devices: Inspected and Serviced – 12 months

SCUBA Cylinders*: Internal Visual Inspection – 12 months;
Hydrostatically tested – 5 years

** Records for cylinders not owned by divers or the University need not be submitted to the DSO; however, divers must ensure that such cylinders are properly inspected and tested before use.*

Diver's Statement of Understanding Regarding Equipment Requirements

I, _____, hereby acknowledge that I understand and will follow the equipment requirements as specified in the Florida Atlantic University Diving and Boating Safety Diving Manual and use only equipment specified on the Approved Equipment List. I will only dive with equipment with which I have been properly trained and with which I am comfortable. Furthermore, I will service my equipment periodically as required and at any time that the performance or integrity of the equipment is in question. I will not perform a dive without the proper complement of equipment appropriate to the dive conditions, nor will I use experimental equipment as my primary gear. I will always dive with an approved alternate air source, timing device, and dive buddy. I understand that I (or my lead diver) must always submit a dive plan to the Diving Safety Officer (DSO) before diving and that the DSO can may establish further additional requirements as deemed necessary for the particular diving environment.

Signature

Date

