Battle of the Atlantic

Research and Expedition Group

Diving Standard Operating Procedures (DSOP)

v1.2.1

17 March 2018

Revision History

Date	Version	Description of Change
2016-05-05	1.0	Initial Issue
2016-06-15	1.1	Added Section 5.2 Added pre-approval for solo divers in Section 6.2.1 Modified Section 6.4.3 Removed Section 6.4.4 Revised Appendix A to suit provisions for solo diving
2017-12-11	1.2	Added Section 7, Appendix E and Appendix F Added Reference (2)

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References

(1) BAREG Charter.

(2) BAREG Standard Operating Procedures for the Conduct of SCUBA Training.

1 Introduction

1.1 The Battle of the Atlantic Research and Expedition Group (BAREG) sponsors or conducts Training Activities and Expeditions every year

1.2 Historical Expeditions s are those, the purpose of which is primarily the investigation or exploration of a historically-significant shipwreck. Data collection in the form of photography and/or videography may be undertaken, but data collection is not the primary purpose of the trip. Funding is provided by the individual members participating in the expedition.

1.3 Archaeological Expeditions are diving projects/field work where the primary purpose is maritime archeological data collection via a variety of mechanisms, including but not limited to photography, videography, and/or traditional archaeological recording techniques. Group expeditions may be funded by the individual members participating in them or by the Group, using monies obtained via grants and/or donations.

1.4 Group Training dives are where the primary purpose is to train members in more advanced aspects of diving, from advanced recreational specialties to technical diving requiring decompression. Group training dives are funded by the individual members participating in them, dive professionals affiliated with the Group, the Group itself, or a combination thereof. See the BAREG Standard Operating Procedures for the Conduct of SCUBA Training, Reference (2), for comprehensive procedure on the conduct for Group Training dives.

2 Purpose

2.1 This Standard Operating Procedure (SOP) outlines BAREG's protocols for conducting expedition and training dives. It should be followed to minimize risks associated with diving activities and promote safety as a priority for all relevant diving activities.

3 Scope

3.1 The scope of this SOP extends to Group expeditions and training dives during which the Group is conducting dive operations completely independent of any dive charter operator; dive shop; Federal, State, or local government; or any other organization providing an umbrella of liability coverage. The procedures contained herein shall be followed for any such dive.

3.2 This SOP does not apply to Historical or Training Expeditions conducted on commercial charter vessels.

3.3 This SOP is not intended to supersede protocols by suitably qualified medical or emergency management personnel. Once on scene, follow the directions of these trained professionals.

3.4 This SOP is not intended to supersede protocols or standards of the governing training agency, SDI-TDI. Any and all procedures or standards of SDI-TDI shall be followed and adhered to.

4 Membership

4.1 At a minimum, the following forms must be completed, signed and on file with the Group prior to being eligible to participate in any BAREG sanctioned dive:

- BAREG Membership Form.
- BAREG Liability Release and Assumption of Risk Agreement (Appendix A).
- The Expedition Leader shall have a copy of the latest membership roster, including emergency contact information.

4.2 BAREG annual membership fees must be paid and current before participating in BAREG diving activities.

4.3 Refer to Reference (1) for specific membership details.

5 Diving Qualifications

5.1 Recreational (Non-Decompression) Diving

5.1.1 To undertake no-decompression diving to a depth of 60 ft or less with BAREG the diver must hold, at a minimum, a recognized Open Water (OW) qualification.

5.1.2 To undertake no-decompression diving to a depth of 130 ft or less with BAREG the diver must hold, at a minimum, recognized Advanced Open Water (AOW) and basic Nitrox qualifications.

5.2 Independent (Solo) Diving

5.2.1 To undertake independent (solo) dive operations with BAREG the diver must meet the following conditions:

- Said diver has the express, explicit approval of the Expedition Leader. The Expedition Leader's decision in this regard will be final.
- Said diver is in possession of a Solo Diver certification from a recognized training agency.
- Said diver possesses the following equipment:

- Redundant gas supply (pony bottle or doubles);
- Reel and surface marker buoy;
- Surface audible signaling device;
- Redundant computer (or one computer plus depth gauge-bottom timer and manual tables);
- Primary and backup masks;
- Redundant cutting devices.

- Said diver has completed the applicable paragraph of the BAREG Liability Release and Assumption of Risk Agreement.

5.2.2 Solo decompression or penetration diving will not be permitted.

5.3 Open Circuit Decompression (Technical) Diving

5.3.1 To undertake decompression diving with BAREG the diver must hold a recognized decompression qualification.

5.3.2 In order to dive a breathing gas mix other than air the diver must hold a recognized qualification to use that gas mix.

5.3.3 To dive over 130 ft the diver must hold a recognized certification to dive over 130 ft.

5.4 Closed Circuit Diving

5.4.1 To dive using a rebreather, the diver must hold a recognized qualification to use a rebreather.

5.4.2 To dive using a rebreather and gas mix other than air, the diver must hold a recognized qualification to use a mixed gas rebreather.

5.4.3 To dive over 130 ft the diver must hold a recognized certification to dive over 130 ft.

6 Expedition Diving

6.1 General

6.1.1 Expedition dives are dives sponsored by BAREG and have specific exploration/archeological objectives. Expedition dives require Board approval.

6.1.2 BAREG exploration & archeological dives which are deemed Expedition Dives will be team-focused with clearly defined goals specified by the Board or Expedition Leader.

6.1.3 Group support systems will be structured to accommodate a team approach to limit logistical stress and ensure emergency systems can be readily and easily provided if necessary.

6.1.4 Dives will be limited to specified project goals agreed to by the Expedition Leader and will be structured to allow the least logistical demands to maximize support procedures. Similar equipment, dive procedures, and emergency requirements will be established and agreed jointly by the Expedition Leader and divers.

6.2 Diving Related Positions

6.2.1 Expedition Leader

- Must be approved by the Board.
- Coordinates the logistical requirements of the Expedition.
- Defines expedition goals.
- Has the right to veto any Dive/Dive Plan/Diver before or during the expedition.
- Must expressly and explicitly grant approval prior to anyone participating in dive operations as a solo diver.

6.2.2 Dive Supervisor

- Required for each dive.
- Assumes the role of Diving Safety Officer (DSO) while on expedition.
- Appointed by the Expedition Leader.
- Must understand the support requirements of the level of diving to be undertaken.
- Controls and coordinates all surface, support and documentation requirements and activities.
- Assumes surface control of the dive once the shot line has been successfully deployed.
- Is able to delegate pre-dive tasks as required but retains overall responsibility for their completion.
- Manages emergency procedures.

- Has the right to veto any Dive/Dive Plan/Diver before the dive.
- Returns all diving forms to Deputy Operations Coordinator for filing upon completion of expedition.

6.2.3 Support Divers (as required)

- Assists all surface and in water support requirements as specified by the Dive Supervisor.
- Assists in any emergency procedure activity.
- Must be briefed by Dive Supervisor on the support diver requirements of the dive being undertaken.

6.2.4 Dive Vessel Operator

- Can act as Dive Supervisor if requirements are met.
- To liaise with Expedition Leader on requirements of boat support operations of the dive.

6.3 Diving Forms

6.3.1 Emergency Management Form

- Completed by Dive Supervisor in the event of an emergency.
- Records times and types of emergency activities.
- See Form NF 57-03-01 Diving Incident Report Form from [http://www.ndc.noaa.gov/forms.html] (Appendix B).

6.3.2 Divers' Log

- Completed by Dive Supervisor before & after dive.
- Logs Diver's plan, gas and dive times.
- See Form NF 57-03-25 Supervisor Dive Log from [http://www.ndc.noaa.gov/forms.html] (Appendix C).

6.3.3 Support Diver Manual

- Lists procedures for Support Divers (to be published).

6.3.4 Diving Emergency Assistance Plan (DEAP)

- Completed by Expedition Leader for each unique diving location with the initial dive plan of each calendar day and every time any information on the DEAP changes.
- See Form NF 57-03-21 Diving Emergency Assistance Plan (DEAP) Form from [http://www.ndc.noaa.gov/forms.html] (Appendix D).

6.4 Procedures / Protocols

6.4.1 Dive Plans shall be filed with the Dive Supervisor prior to the day's dives.

6.4.2 BAREG divers log to be completed for every dive.

6.4.3 Maximum depth allowable when breathing air is 130 ft. Use of Nitrox for all dives exceeding 60 ft will be highly encouraged.

6.4.4 All dives conducted with a minimum of two divers per team - solo diving is not permitted. The composition of the standard BAREG dive team during expeditionary dives will be 2-3 divers. By exception, a diver may conduct independent (solo) dive operations only when the provisions of paragraph 5.2 above have been met.

6.4.5 All divers shall carry the following additional equipment on all dives:

- 1 x Surface Marker Buoy (SMB) - communication slate recommended.
- 1 x ascent reel with adequate line for the depth.

6.4.6 At no time shall a diver use a bottom mix whose PO_2 exceeds 1.4 or a decompression mix whose PO_2 exceed 1.6.

6.4.7 It is recommended that on any mixed gas technical dive deeper than 150 ft, all divers shall complete at least 10 minutes surface decompression on their last deco gas, conditions permitting.

6.5 Decompression Schedules

6.5.1 Decompression Schedules shall reflect current decompression theory.

6.5.2 No diver shall ascend at a rate greater than 30 ft per minute for any portion of the dive, unless required for a particular profile and previously planned with the Dive Supervisor.

6.5.3 Dive plans can be vetoed by the Dive Supervisor or other dive team members for valid safety reasons.

6.6 Gas Filling Protocols

6.6.1 It is the diver's responsibility to verify that any gas mixtures intended to be used during any segment of their dive plan (either as a bottom, travel, decompression, or bailout gas) is correctly analyzed as being within +/- 1% of their marked content.

6.6.2 Breathing gas shall be marked with (1) mix, (2) Maximum Operating Depth (MOD), (3) date analyzed and (4) initials of person analyzing.

6.7 Additional Standards for Open Circuit Diving

6.7.1 Divers shall have on hand all decompression schedules required to deal with the loss of any one gas supply. Use of a multiple-gas decompression personal dive computer is sufficient for fulfillment of this requirement.

6.7.2 Each diver shall have on his person a multiple-gas decompression personal dive computer, a depth gauge/bottom timer, and a written back-up dive plan. A second multiple-gas decompression personal dive computer may be substituted for the depth-gauge/bottom timer and written back-up plan.

6.7.3 A dive team shall carry enough reserve gas to deal with the loss of any one gas supply by one member of the team such that they are able to reach their next planned gas switch.

6.8 Additional Standards for Rebreather Diving

6.8.1 It is the responsibility of each diver to ensure the rebreather checklists are completed prior to the dive.

6.8.2 The maximum depth of any dive shall not exceed a depth where the PO_2 in an onboard diluent cylinder exceeds 1.4.

6.8.3 Unless planning for the use of staged decompression gas (see Section 6.9) the diver shall carry enough bailout gas to safely ascend and decompress in the event of a loop failure. Bailout plans will be based on a “worst case” scenario with bailout planned from the maximum intended bottom time.

6.9 CCR Staged Bailout

6.9.1 Plans relying on staged bailout decompression gas must be approved by the Expedition Leader.

6.9.2 Divers relying on staged bailout decompression gas shall carry enough bailout gas to safely ascend and carry out all decompression stops to 130 ft and be able to remain at this depth for no less than 10 minutes. (In the event of a blue water ascent, this gives surface support 10 minutes to drop decompression gas to the diver.)

6.9.3 Any dive relying on staged bailout decompression gas is required to have enough staged gas and cylinders to support 50% of the divers relying on this gas.

6.9.4 Surface support shall have at least one set of staged bailout decompression gas ready for immediate deployment at all times.

6.9.5 It is recommended that any rebreather diver relying on staged bailout decompression gas incorporate a method for connecting the staged gas to their rebreather to allow such use as SCR mode.

6.9.6 All staged bailout decompression gas shall have open circuit bailout regulators attached.

6.9.7 Staged bailout decompression gas shall be uniform across the entire dive team.

6.9.8 If diving in a mixed open circuit and CCR dive team then both the open circuit and CCR divers shall use uniform staged bailout decompression gas.

6.9.9 The Expedition Leader shall have final approval of the proposed staged bailout gas selection.

6.9.10 Staged bailout decompression gas requirements should include a 20% safety margin on gas required based upon the highest consumption rate of divers in the team.

6.10 Additional Standards for Dives greater than 300 ft

6.10.1 It is recommended that CCR divers carry semi-closed bailout tables for the gases available to them.

6.10.2 No repetitive diving within 24 hours.

6.10.3 It is recommended that divers will have support in water for the final portion of decompression. This can be provided either by other members of the dive team or support divers.

6.10.4 A mobile chase boat or dive vessel must be available at all times during the dive.

7 Training Dives

7.1 Professional Status

7.1.1 On August 31, 2017 SDI-TDI approved BAREG's application and granted the Group status as SDI-TDI Training Facility 1004534. The SDI-TDI designation of Training facilities is a category of affiliate specifically designed for schools and universities; state, local and Federal government organizations; and non-profit corporations.

7.2 Student Pre-Requisites

7.2.1 Students must be a member of BAREG.

7.2.2 Students must have dive accident insurance.

7.2.3 Students must possess a level of physical fitness and mental maturity suitable for the environment and conditions of the level of training requested. Final determination of suitability of prospective students to participate in a training program resides with the course instructor.

7.3 Course Requirements

7.3.1 All courses shall be conducted in accordance with current SDI-TDI standards. Latest standards shall be obtained from the SDI-TDI website.

7.3.2 An SDI-TDI Medical Statement form (Appendix E) shall be completed by the student and, if required by SDI-TDI Standards, his or her physician and provided by the student prior to commencing training, either academic or in-water.

7.3.3 Additional details on the conduct of Group training dives can be found in the BAREG Standard Operating Procedures for the Conduct of SCUBA Training, Reference (2).

7.4 Required Documentation

7.4.1 Emergency Action Plans (EAPs) shall be readily available at locations for which training dives are conducted. EAPs for frequented locations can be found in Appendix F, and will be added to this SOP as facilities are utilized to conduct training dives.

7.5 Required Equipment

7.5.1 An Oxygen (O2) kit shall be readily available at locations of training dives. The kit may be either the Group's kit, or one made available (confirmed prior to conducting dives) from the facility/charter operator.

8 Emergency Procedures

8.1.1 Dive Supervisor shall have relevant contact details for emergency support services.

8.1.2 All persons on the dive (support and bottom divers) must be familiar with the BAREG emergency protocols prior to the dive.

8.1.3 Dive Supervisor must ensure all emergency equipment is operational before the dive commences (i.e. check and gauge O_2).

8.1.4 Dive Supervisor must ensure that the boat operator is briefed as to their role in an emergency situation.

8.1.5 The Dive Supervisor has total authority in any emergency situation until relieved by suitably qualified medical or emergency management personnel.

8.1.6 Emergency Management Form must be completed by Dive Supervisor in the event of activating any emergency protocol. Records times and types of emergency protocols activated.

8.1.7 Any diver requiring treatment in a recompression chamber will be required to have an assessment by a hyperbaric physician before undertaking further diving.

8.1.8 Expedition Leader to ensure all required back up and emergency equipment is available and in good working order immediately prior to the start of the expedition.

8.2 Drifting Decompression Diver

8.2.1 After first observing a SMB on the surface any member is to notify the Dive Supervisor to record the time.

8.2.2 If no other divers are in the water, the dive or chase boat will proceed to drifting diver and deploy any pre-planned staged decompression gas required on reserve deco line.

8.2.3 SMB communications slate to be read and information relayed to Dive Supervisor for recording.

8.2.4 Surface team will continue to monitor surface for more drifting divers until the deep phase of every diver's decompression schedule is complete to ensure no more drifting divers.

8.2.5 Only when the deep phase is complete should support dive enter the water to check on drifting decompression diver.

8.2.6 No attempt shall be made to tow the decompression diver, SMB or deco line unless the decompression diver has positively acknowledged this to the surface support platforms either by hand signal or by slate.

8.3 Omitted Decompression: Conscious/relaxed diver

8.3.1 A diver presenting themselves on the surface before their decompression schedule is complete and having no symptoms of DCI shall immediately (within 5 minutes) return to a depth where they violated their decompression ceiling accompanied by a support diver and complete the omitted decompression procedure.

8.3.2 The support team shall provide assistance in getting the diver below the surface by:

- Transporting additional decompression gas to the diver.
- Assisting with any equipment failure.
- Obtaining replacement or additional equipment necessary for the diver to complete their decompression.
- Remaining with the decompressing diver at all times.

8.3.3 If the depth to be reached is beyond the maximum depth planned for by the support diver then both the decompressing & support diver shall return to the maximum safe depth of the support diver and remain there until:

- Relieved by a member of the bottom team or another support diver.
- The decompressing diver "catches up" with their decompression plan.
- The support diver has to begin their ascent according to their own dive plan.

8.3.4 A diver shall not carry out omitted decompression without having another diver present in the water with them.

8.3.5 BAREG schedules for omitted decompression are adapted from the U.S. Navy Diving Manual Revision 6. Omitted Decompression Procedures:

- Diver return to a depth 10 ft deeper from where they violated their ceiling and remain there for the planned time or 5 minutes, whichever is greater.

- All decompression stops up to 40 ft shall be conducted as per the dive plan.
- Starting at 40 ft all stops must be at least 50% longer than the planned stop time. Upon reaching the surface the diver shall undertake at least 10 minutes surface decompression using their last deco gas before exiting the water (as long as surface conditions allow).

8.3.6 Upon exiting the water the diver shall undertake at least 10 minutes breathing 100% oxygen while relaxed and hydrating with fluids.

8.3.7 The Dive Supervisor shall ensure the diver is constantly monitored for any signs or symptoms of DCI for at least 1 hour after exiting the water (See Neuro Exam).

8.3.8 If the diver shows any sign of DCS then the Dive Supervisor shall undertake an emergency procedures assessment to ascertain the most appropriate action.

8.3.9 Any diver undertaking Omitted Decompression shall refrain from diving for at least 48 hours.

8.4 Omitted Decompression: Unconscious or Distressed diver

8.4.1 An unconscious or distressed diver who is incapable of returning to decompression will be treated as a diving casualty and an emergency procedures assessment will be undertaken to ascertain the best course of action.

8.5 Equipment

8.5.1 The Dive Supervisor shall ensure that the following emergency equipment shall be available during any BAREG Expedition dive:

- Sufficient oxygen to keep a patient on continuous O2 until emergency services arrive.
- Printed copy of in IWR Method along with emergency services contact details.
- Standards diver's first aid kit.
- Minimum 8 liters of drinking water / isotonic fluid designated for emergency use only.
- Adequate communication devices for area (VHF/HF radio, mobile phone with working network coverage, etc).
- Method of accurately determining exact position (Lat/Long) to relay to emergency services.

APPENDIX A: BAREG Liability Release and Assumption of Risk Agreement

Battle of the Atlantic

1914-1918 1939-1945

Research and Expedition Group

RELEASE OF LIABILITY, WAIVER OF CLAIMS, EXPRESS ASSUMPTION OF RISK AND INDEMNITY AGREEMENT

For _____ (specify training course, trip, or expedition) being conducted by or in cooperation with the Battle of the Atlantic Research and Expedition Group, hereafter referred to as "BAREG". Please read carefully, fill in all blanks and initial each paragraph before signing at bottom.

I, _____, hereby affirm that I have been advised and thoroughly informed of the inherent hazards of scuba diving activities.

_____ Further, I understand that diving with compressed air, oxygen enriched air (nitrox), oxygen, or trimix supplied by standard open circuit scuba, semi-closed circuit rebreathers, or fully closed circuit rebreathers involves certain inherent risks including decompression sickness, embolism, oxygen toxicity, inert gas narcosis, marine life injuries, or other barotrauma/hyperbaric injuries can occur that require treatment in a recompression chamber. I further understand that BAREG dive operations may be conducted at sites that are remote, either by time of distance or both, from such a recompression chamber. I still choose to proceed with these dives in spite of the possible absence of a recompression chamber in proximity to the dive site.

_____ I understand and agree that neither the officers, directors, instructors, expedition leaders, trip leaders, affiliated organizations/companies, employees, agents, or assigns of BAREG, nor the authors of any materials including texts and tables expressly used for training and certification (hereinafter referred to as "Released Parties") may be held liable or responsible in any way for any injury, death, or other damages to me or my family, heirs, or assigns that may occur as a result of my participation in this training course, trip, or expedition, or as a result of the negligence of any party, including the Released Parties, whether passive or active.

_____ In consideration of being allowed to participate in this course, trip, or expedition, I hereby personally assume all risks in connection thereto, for any harm, injury, or damage that may befall me while I am enrolled as a participant in this activity, including all risks connected therewith, whether foreseen or unforeseen.

_____ I further agree to save, defend, indemnify, and hold harmless said activity and Released Parties from any claim or lawsuit by me, anyone purporting to act on my behalf, my family, estate, heirs or assigns, arising directly or indirectly out of my enrollment and participation in this activity including both claims arising during the activity or after its conclusion even if such claims may be groundless, false or fraudulent.

_____ I also understand that diving activities are physically strenuous and that I will be exerting myself during this activity, and that if I am injured as a result of heart attack, panic, hyperventilation, oxygen toxicity, inert gas narcosis, drowning, etc. that I expressly assume the risk of said injuries and that I will not hold the above listed individuals or companies responsible for the same, and I agree to defend, indemnify, and hold harmless said activities and Released Parties for any such injuries incurred by me.

_____ I understand that these activities may place me at a depth from which I will be unable to safely execute a free (without breathing gas) ascent.

_____ I understand that I will be required to furnish my own equipment and that I am responsible for its operating condition and maintenance.

_____ I further state that I am of lawful age and legally competent to sign this liability release.

_____ I am aware of the required certification level and/or experience necessary and recommended for participating in this training course, trip, or expedition, and I hereby certify I meet those requirements for prior certification or equivalent experience.

_____ I pledge to adhere to the following safe diving practices while participating in this sanctioned BAREG activity:

- I will maintain good mental and physical fitness for diving.
- I will not be under the influence of alcohol or recreational drugs when diving. Other drugs will be used only on the advice and approval of an appropriate health care professional.
- I will maintain proficiency in diving skills, striving to increase them through continuing education. I will periodically practice and review specific diving skills in controlled conditions.

- I will engage only in diving activities consistent with my training and experience.

- I will only use complete, well-maintained, reliable equipment with which I am familiar; and inspect it for correct fit and function prior to each dive. If diving a rebreather (SCR or CCR), I will be specifically trained and qualified for the particular rebreather. I will deny use of technical diving equipment to divers uncertified in its use.

- I will always have at least a single functioning redundant air system (pony/bailout bottle, independent doubles, or doubles with an isolation manifold) on a dive, and if one fails, use the other to abort the dive.

- I will listen carefully to dive briefings and directions and respect the advice of those supervising my diving activities.

- I will adhere to the Diving Standard Operating Procedure (DSOP) on every dive. I agree that the overriding priority of every dive is for the entire team to return safely.

- I acknowledge that diving alone may add risk by depriving me of a team mate who can assist me in the event of, or to prevent, an accident or incident, and understand that any available supervisory staff may have little or no opportunity to affect a timely assist or rescue.

- I will not exceed the following partial pressures of oxygen:

  - 1.4 bar/ATM as a bottom PO_2 on open-circuit scuba;
  - 1.3 bar/ATM as a bottom PO_2 on a rebreather;
  - 1.6 bar/ATM under any circumstances.

- I will maintain proper buoyancy during the diving activity.

- I will carry at least one surface signaling device (signal tube, whistle, mirror) when diving in open water.

- I will always dive with a surface marker buoy or lift bag and reel to provide an emergency ascent line and to make my position visible from the surface.

- I will bail out without delay if I have a problem when diving with a rebreather. I acknowledge that any diver can bail out at any time for any reason.

- I will stay within accepted gas narcosis limits. I recognize that oxygen is considered a narcotic gas when determining narcotic limits. I will use helium gas blends, with the proper training, and accept the risks of helium diving, to reduce narcosis to within acceptable limits when making dives that would otherwise exceed those limits.

_____ I understand that if I am granted permission by the Expedition Leader to conduct independent (solo) diving operations under the provisions of paragraph 6.4.3 of the BAREG Dive SOP, I hereby affirm:

- That I understand and agree that neither the BAREG Expedition Leader, _____, nor the Battle of the Atlantic Research and Expedition Group as a corporate entity, nor any of their respective employees, officers, agents or assignees, nor the dive vessel, nor the dive operation through which I am granted the privilege of solo diving, nor my dive buddy, nor other participants in this solo diving activity (hereinafter referred to as Released Parties) may be held liable or responsible in any way for any injury, death or other damages to me or my family, heirs or assignees that may occur as a result of my participation in solo diving as a result of the negligence of any party, including the Released Parties, whether passive or active.
- That I have been advised of the inherent hazards of solo scuba diving and further understand that I will not have a buddy to assist me should any dive accident occur or malady arise during the dive.
- That I further pledge that in consideration for being allowed to solo dive, I hereby personally assume all risks in connection with this activity for any harm, injury, or damage that may befall me while I am solo diving, including all risks connected therewith, whether foreseen or unforeseen, even if caused by the negligence of the Released Parties.
- That I further save and hold harmless the Released Parties from any claim or lawsuit by me, my family, estate, heirs or assignees arising out of my participation in solo diving, including all claims arising before, during, and after this solo diving activity, even if caused by the negligence of the Released Parties.
- That I further state that I am already a certified solo diver and have been truthful in stating my qualifications as a certified solo diver, and have the following solo diver certifications from the following training agencies: _____, that I am aware of the requirements for solo scuba diving under the provisions of paragraph 6.4.3 of the BAREG Dive SOP, and that I meet all requirements.

I understand that the terms herein are contractual and not a mere recital, and that I have signed this document of my own free act. Further that I understand

and agree that, in the event that one or more of the provisions of this agreement, for any reason, is held by a court of competent jurisdiction to be invalid or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision hereof, and this agreement shall be construed as if such invalid, illegal or unenforceable provision or provisions had never been contained herein.

IT IS THE INTENTION OF _____ BY THIS INSTRUMENT TO EXEMPT AND RELEASE THE OFFICERS, DIRECTORS, INSTRUCTORS, EXPEDITION LEADERS, TRIP LEADERS, AFFILIATED ORGANIZATIONS/COMPANIES, EMPLOYEES, AGENTS, OR ASSIGNS OF BAREG (AND OTHERS, _____) AND ALL OTHER RELATED ENTITIES AND RELEASED PARTIES AS DEFINED ABOVE, FROM ALL LIABILITY OR RESPONSIBILITY WHATSOEVER FOR PERSONAL INJURY, PROPERTY DAMAGE OR WRONGFUL DEATH HOWEVER CAUSED, OR ARISING OUT OF, DIRECTLY OR INDIRECTLY, INCLUDING, BUT NOT LIMITED TO, THE NEGLIGENCE OF THE RELEASED PARTIES, WHETHER PASSIVE OR ACTIVE. I HAVE FULLY INFORMED MYSELF OF THE CONTENTS OF THIS LIABILITY RELEASE AND EXPRESS ASSUMPTION OF RISK BY READING IT BEFORE SIGNING IT ON BEHALF OF MYSELF AND MY HEIRS. THIS INSTRUMENT SHALL BE GOVERNED BY THE LAWS OF THE STATE OF NORTH CAROLINA.

I HAVE READ THIS AGREEMENT, I UNDERSTAND IT, I AGREE TO BE BOUND BY IT.

_____

Signature of Participant / Date / Time

_____

Printed Name and Signature of Witness / Date / Time

INSTRUCTOR/LEADER CONFIRMATION

I HAVE REVIEWED THIS AGREEMENT AND CONFIRM THAT IT HAS BEEN PROPERLY COMPLETED.

_____

Signature of Instructor/Leader / Date / Time

APPENDIX B: Sample Diving Incident Report Form

NOAA Form 57-03-01
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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DIVING INCIDENT REPORT

NOTE: The Unit Diving Supervisor (UDS) shall use this form to report serious diving related injuries, including near-drowning, arterial gas embolism (AGE), decompression sickness (DCS), pulmonary barotrauma, or any diving injury that requires hospitalization. An additional narrative and detailed analysis of the incident must be attached. Contact the NOAA Diving Center (NDC) to determine whether an event or minor injury requires an incident report.

SECTION I. DIVING ACCIDENT VICTIM GENERAL INFORMATION

DIVER NAME		TIME of INCIDENT	DATE of INCIDENT
DIVER CERTIFICATION	DIVE UNIT	LOCATION of INCIDENT	
DIVER CURRENT MEDICATIONS		DIVER CURRENT HEALTH PROBLEMS	

For NOAA observer divers and non-NOAA divers, complete the remaining blocks in Section I. For NOAA divers, proceed to Section II.

AGE	SEX (M/F)	HIGHEST DIVE CERTIFICATION LEVEL	CERTIFYING DIVING ASSOCIATION
TOTAL # of YEARS DIVING	TOTAL # of DIVES	TOTAL # of DIVES in the PAST 6 MONTHS	PREVIOUS DIVE INCIDENTS and DATES

SECTION II. EQUIPMENT USED BY THE DIVING ACCIDENT VICTIM

BREATHING LOOP ☐ Open Circuit ☐ Semi Closed / Closed Circuit ☐ Surface Supplied ☐ Snorkel	DIVER DRESS ☐ None / Dive Skin ☐ Wet Suit Thickness ☐ Dry Suit	DIVE CYLINDER TYPE and SIZE	CYLINDER PRESSURE IN	SEP-ISSUED EQUIPMENT? ☐ YES ☐ NO
		BREATHING GAS	CYLINDER PRESSURE OUT	DIVER FAMILIAR WITH EQUIPMENT? ☐ YES ☐ NO

SECTION III. DIVE INFORMATION – Incident Dive

NAME of ON-SITE DIVING SUPERVISOR / LEAD DIVER	AIR TEMP (°F)	WATER TEMP (°F)	U/W VISIBILITY (FT)	CURRENT SPEED (KTS)
NAME of DIVE BUDDY	DIVE PURPOSE	DIVE LOCATION		
DIVE BUDDY AFFILIATION	DIVE PLATFORM	SURFACE CONDITIONS		

# of DIVES on DAY of INCIDENT	# of DIVES on PREVIOUS DAY	TYPE of DIVE ☐ DUTY ☐ non-DUTY	DIVES CONDUCTED WITH ☐ Dive Tables ☐ Dive Computes (Model ____)
Was this dive typical of the diver's normal type of diving? ☐ YES ☐ NO		If NO, explain:	
Describe any problems encountered during the incident dive or previous dives:			

SECTION IV. DIVE PROFILES – Day of Incident (Additional dive profiles for the day of the diving incident can be attached to this form.)

Dive #	Start Time	Max Depth (Feet)	Bottom Time (Minutes)	End Time	Surface Interval (HH:MM)	Deco Stop? (Y/N)	Safety Stop? (Y/N)	Stop Profile (Depth / Time)	Cold or Arduous? (Y/N)	Fast Ascent? (Y/N)	Incident Dive? (Y/N)
1.											
2.											
3.											
4.											
5.											
6.											

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DIVING INCIDENT REPORT FORM

SECTION V. EMERGENCY PROCEDURES

YES	NO		YES	NO	
☐	☐	Was emergency oxygen available on-site?	☐	☐	Was there a dive accident management plan in place for dive site?
☐	☐	Were emergency scenarios discussed with all divers prior to diving operations, such as low air, out of air, lost buddy, etc.?	☐	☐	Was the dive accident management plan reviewed by all divers and support personnel prior to diving operations?

SECTION VI. SYMPTOMS, PRE-DIVE HEALTH, and ON-SITE MEDICAL TREATMENT

DATE of SYMPTOM ONSET

TIME of SYMPTOM ONSET

DESCRIPTION of SYMPTOMS and LOCATION on BODY

DESCRIPTION of PRE-DIVE HEALTH

DESCRIPTION of PRE-DIVE ALCOHOL CONSUMPTION (previous 24 hours)

DESCRIPTION of PRE-DIVE REST or FATIGUE LEVELS

DESCRIPTION of STRENUOUS EXERCISE (6 hours prior and 12 hours post-dive)

SUSPECTED INJURIES or ILLNESSES
- ☐ AGE
- ☐ DCS
- ☐ Pulmonary Barotrauma
- ☐ Other Barotrauma
- ☐ None
- ☐ Other

ON-STE OXYGEN ADMINISTRATION
Delivery Method

Time Started

Time Stopped

ON-SITE FIRST-AID TREATMENT PROVIDED

INITIAL EMERGENCY CONTACT (name of person or agency)

TIME of INITIAL EMERGENCY CONTACT

TIME TRANSPORTATION STARTED

FIRST-AID TREATMENT PROVIDED DURING TRANSPORT

EMERGENCY TRANSPORT METHOD(S)

SECTION VII. MEDICAL INFORMATION – Hospital (Attach all Emergency Room, Hyperbaric Unit, and follow-up medical records.)

HOSPITAL NAME and ADDRESS

HOSPITAL TREATMENT

DATE of ARRIVAL

TIME of ARRIVAL

HYPERBARIC UNIT NAME and ADDRESS

CHAMBER TYPE
- ☐ Monoplace
- ☐ Mulitplace

CHAMBER TREATMENT
Treatment #1 Time Started _____ Time Stopped _____
Treatment #2 Time Started _____ Time Stopped _____
Treatment #3 Time Started _____ Time Stopped _____

TREATMENT TABLE / DESCRIPTION

TABLE EXTENSIONS

RETREATMENT TABLE / DESCRIPTION

DESCRIBE WHEN RELIEF FROM SYMPTOMS OCCURED

DESCRIBE ANY RESIDUAL SYMPTOMS AFTER TREATMENT

DAYS of RESIDUAL SYMPTOMS

FINAL DIAGNOSIS
- ☐ DCS I
- ☐ AGE
- ☐ Pulmonary Barotrauma
- ☐ DCS II
- ☐ Other

SECTION VIII. CERTIFICATION

UDS NAME

UDS SIGNATURE

DATE

NOTE: A Diving Incident Report shall be completed by the UDS and submitted to their Line Office Diving Officer (LODO) within 10 days of the diving incident. A full report includes the following items:

1. Diving Incident Report Form (NOAA Form 57-03-01)
2. Cover memorandum providing a narrative of the diving incident, including causal analysis and recommendations for prevention of future injuries.
3. Medical records associated with any medical treatment of injuries resulting from this incident.

The LODO shall submit the UDS report, along with their own causal analysis and recommendations for prevention of future injuries to the Director, NOAA Diving Program within 30 days of the diving incident.

RESET

APPENDIX C: Sample Supervisor's Dive Log Form

NOAA Form 57-03-25
(8-12)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

SUPERVISOR'S DIVE LOG

DIVEMASTER	LOCATION	PLATFORM	DATE	DIVE #

Team #	NAME of DIVER	Surface Interval hr:min	Repetitive Group IN	Planned Depth (feet)	Planned Time hr:min	PSI IN Main / RASS	Time (local) DOWN	Time (local) UP	Actual Depth (feet)	Actual Time hr:min	PSI OUT Main / RASS	Repetitive Group OUT	Project/ Comments/ Problems

NOTES:

APPENDIX D: Sample Diving Emergency Plan Form

NOAA Form
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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DIVING EMERGENCY ASSISTANCE PLAN

NOAA DIVING UNIT	DIVE LOCATION	CALENDAR YEAR

INSTRUCTIONS:

Complete a Diving Emergency Assistance Plan (DEAP) for each unique diving location and submit the plan to NDP.Diveplans@noaa.gov with the initial dive plan of each calendar year and every time any information on the DEAP changes.

GENERAL PROCEDURES:

A. Evaluate the victim's Circulation, Airway, and Breathing (CABs). If necessary, begin cardiopulmonary resuscitation (CPR) using a manually triggered ventilator (MTV) or bag-type oxygen resuscitator.

B. If the victim is breathing, but unconscious, place the victim in the recovery position and administer oxygen using a non-rebreather type mask.

C. If the victim is awake and alert, place the victim in a position of comfort and administer 100% oxygen using an MTV/demand oxygen resuscitator or non-rebreather type mask. If the victim is not nauseated, give clear non-alcoholic/non-caffeinated fluids to drink.

D. If the victim's condition is life threatening or urgent, call the local Emergency Medical Services (EMS) or U. S. Coast Guard (USCG) for transport to the nearest medical treatment facility.

E. If the victim's condition is not urgent, contact the NOAA Dive Medical Officer (DMO) for guidance. If unable to reach the NOAA DMO within 15 minutes, contact the Divers' Alert Network (DAN).

F. Use the Dive Accident Management Field Reference Guide to document a neurological exam and dive history information.

G. Gather additional information about the incident and prepare the victim for transport.

H. Secure the diver's gear for inspection. **DO NOT DISASSEMBLE GEAR OR EXHAUST AIR FROM THE SYSTEM**. Close the cylinder valve ONLY. Count and record number of turns required to secure the valve.

I. Call and speak to the NOAA DMO, (855) 822-DIVE (3483), to report the incident.

J. Call the Line Office Diving Officer (LODO) to report incident. If unable to reach the LODO, call the Deputy LODO. Continue calling until positive contact is made. Speak to a person, don't just leave a message.

EMERGENCY TRANSPORTATION CONTACTS:

Primary Shore Based Emergency Transportation	
NAME of TRANSPORTATION PROVIDER	
POINT of CONTACT	
PHONE NUMBER	

Secondary Shore Based Emergency Transportation	
NAME of TRANSPORTATION PROVIDER	
POINT of CONTACT	
PHONE NUMBER	

At Sea Vessel Emergency Transportation	
NAME of TRANSPORTATION PROVIDER	
POINT of CONTACT	
PHONE NUMBER	

At Sea Aviation Emergency Transportation	
NAME of TRANSPORTATION PROVIDER	
POINT of CONTACT	
PHONE NUMBER	

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(11-15) Page 2 of 2

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DIVING EMERGENCY ASSISTANCE PLAN

NOAA DIVING UNIT	DIVE LOCATION	CALENDAR YEAR

EMERGENCY CONTACTS:

Primary Operational Hyperbaric Chamber	
NAME of FACILITY	
ADDRESS of FACILITY	
POINT of CONTACT	
PHONE NUMBER	

Secondary Operational Hyperbaric Chamber	
NAME of FACILITY	
ADDRESS of FACILITY	
POINT of CONTACT	
PHONE NUMBER	

Primary Hospital Emergency Room	
NAME of FACILITY	
ADDRESS of FACILITY	
POINT of CONTACT	
PHONE NUMBER	

Secondary Hospital Emergency Room	
NAME of FACILITY	
ADDRESS of FACILITY	
POINT of CONTACT	
PHONE NUMBER	

USCG, Area Search and Rescue (SAR) Coordinator	
NAME of FACILITY	
PHONE NUMBER	

USCG, Rescue Coordination Center (RCC)	
NAME of FACILITY	
PHONE NUMBER	

NOAA DIVING PROGRAM CONTACTS:

Unit Diving Supervisor	
NAME	
EMERGENCY CELL PHONE NUMBER	

Divers Alert Network (DAN)	
EMERGENCY PHONE NUMBER	(919) 684-9111

Line Office Diving Officer	
NAME	
EMERGENCY CELL PHONE NUMBER	
OFFICE PHONE NUMBER	

Deputy Line Office Diving Officer	
NAME	
EMERGENCY CELL PHONE NUMBER	
OFFICE PHONE NUMBER	

NOAA Diving Safety Officer	
EMERGENCY CELL PHONE NUMBER	252-723-1612
OFFICE PHONE NUMBER	252-728-8798

NOAA Diving Medical Officer	
EMERGENCY CELL PHONE NUMBER	(855) 822-3483
OFFICE PHONE NUMBER	(206) 526-6474

RESET

APPENDIX E: SDI-TDI Medical Statement Form

Medical Statement Participant Record (Confidential Information)

Please Read Carefully Before Signing

This is a statement in which you are informed of some potential risks involved in scuba diving and of the conduct required of you during the scuba training program. Your signature on this statement is required for you to participate in the scuba training program offered by

_____
Participant

_____ and
Instructor

_____ located in the
Dive Center

city of _____ and state/province of _____.

Read this statement prior to signing it. You must complete this Medical Statement, which includes the medical questionnaire section, to enroll in the scuba training program. If you are a minor, you must have this Statement signed by a parent or guardian.

Diving is an exciting and demanding activity. When performed correctly, applying correct techniques, it is relatively safe. When established safety procedures are not followed, however, there are increased risks.

To scuba dive safely, you should not be extremely overweight or out of condition. Diving can be strenuous under certain conditions. Your respiratory and circulatory systems must be in good health. All body air spaces must be normal and healthy. A person with coronary disease, a current cold or congestion, epilepsy, a severe medical problem or who is under the influence of alcohol or drugs should not dive. If you have asthma, heart disease, other chronic medical conditions or you are taking medications on a regular basis, you should consult your doctor and the instructor before participating in this program, and on a regular basis thereafter upon completion. You will also learn from the instructor the important safety rules regarding breathing and equalization while scuba diving. Improper use of scuba equipment can result in serious injury. You must be thoroughly instructed in its use under direct supervision of a qualified instructor to use it safely.

If you have any additional questions regarding this Medical Statement or the Medical Questionnaire section, review them with your instructor before signing.

Medical History

To the Participant:

The purpose of this Medical Questionnaire is to find out if you should be examined by your doctor before participating in recreational diver training. A positive response to a question does not necessarily disqualify you from diving. A positive response means that there is a preexisting condition that may affect your safety while diving and you must seek the advice of your physician prior to engaging in dive activities.

Please answer the following questions on your past or present medical history with a YES or NO. If you are not sure, answer YES. If any of these items apply to you, we must request that you consult with a physician prior to participating in scuba diving. Your instructor will supply you with an RSTC Medical Statement and Guidelines for Recreational Scuba Diver's Physical Examination to take to your physician.

_____ Could you be pregnant, or are you attempting to become pregnant?

_____ Are you presently taking prescription medications? (with the exception of birth control or anti-malarial)

_____ Are you over 45 years of age and can answer YES to one or more of the following?
- currently smoke a pipe, cigars or cigarettes
- have a high cholesterol level
- have a family history of heart attack or stroke
- are currently receiving medical care
- high blood pressure
- diabetes mellitus, even if controlled by diet alone

Have you ever had or do you currently have...

_____ Asthma, or wheezing with breathing, or wheezing with exercise?

_____ Frequent or severe attacks of hayfever or allergy?

_____ Frequent colds, sinusitis or bronchitis?

_____ Any form of lung disease?

_____ Pneumothorax (collapsed lung)?

_____ Other chest disease or chest surgery?

_____ Behavioral health, mental or psychological problems (Panic attack, fear of closed or open spaces)?

_____ Epilepsy, seizures, convulsions or take medications to prevent them?

_____ Recurring complicated migraine headaches or take medications to prevent them?

_____ Blackouts or fainting (full/partial loss of consciousness)?

_____ Frequent or severe suffering from motion sickness (seasick, carsick, etc.)?

_____ Dysentery or dehydration requiring medical intervention?

_____ Any dive accidents or decompression sickness?

_____ Inability to perform moderate exercise (example: walk 1.6 km/one mile within 12 mins.)?

_____ Head injury with loss of consciousness in the past five years?

_____ Recurrent back problems?

_____ Back or spinal surgery?

_____ Diabetes?

_____ Back, arm or leg problems following surgery, injury or fracture?

_____ High blood pressure or take medicine to control blood pressure?

_____ Heart disease?

_____ Heart attack?

_____ Angina, heart surgery or blood vessel surgery?

_____ Sinus surgery?

_____ Ear disease or surgery, hearing loss or problems with balance?

_____ Recurrent ear problems?

_____ Bleeding or other blood disorders?

_____ Hernia?

_____ Ulcers or ulcer surgery ?

_____ A colostomy or ileostomy?

_____ Recreational drug use or treatment for, or alcoholism in the past five years?

The information I have provided about my medical history is accurate to the best of my knowledge. I agree to accept responsibility for omissions regarding my failure to disclose any existing or past health condition.

STUDENT

Please print legibly.

Name _____ Birth Date _____ Age _____
First Initial Last Day/Month/Year

Mailing Address _____

City _____ State/Province/Region _____

Country _____ Zip/Postal Code _____

Home Phone ( ) _____ Business Phone ( ) _____

Email _____ FAX _____

Name and address of your family physician

Physician _____ Clinic/Hospital _____

Address _____

Date of last physical examination _____

Name of examiner _____ Clinic/Hospital _____

Address _____

Phone ( ) _____ Email _____

Were you ever required to have a physical for diving? ☐ Yes ☐ No If so, when? _____

PHYSICIAN

This person applying for training or is presently certified to engage in scuba (self-contained underwater breathing apparatus) diving. Your opinion of the applicant's medical fitness for scuba diving is requested. There are guidelines attached for your information and reference.

Physician's Impression

☐ I find no medical conditions that I consider incompatible with diving.

☐ I am unable to recommend this individual for diving.

Remarks _____

_____

_____

_____ Date _____
Physician's Signature or Legal Representative of Medical Practitioner Day/Month/Year

Physician _____ Clinic/Hospital _____

Address _____

Phone ( ) _____ Email _____

Guidelines for Recreational Scuba Diver's Physical Examination

Instructions to the Physician:
Recreational SCUBA (Self-Contained Underwater Breathing Apparatus) can provide recreational divers with an enjoyable sport safer than many other activities. The risk of diving is increased by certain physical conditions, which the relationship to diving may not be readily obvious. Thus, it is important to screen divers for such conditions.

The RECREATIONAL SCUBA DIVER'S PHYSICAL EXAMINATION focuses on conditions that may put a diver at increased risk for decompression sickness, pulmonary overinflation syndrome with subsequent arterial gas embolization and other conditions such as loss of consciousness, which could lead to drowning. Additionally, the diver must be able to withstand some degree of cold stress, the physiological effects of immersion and the optical effects of water and have sufficient physical and mental reserves to deal with possible emergencies.

The history, review of systems and physical examination should include as a minimum the points listed below. The list of conditions that might adversely affect the diver is not all-inclusive, but contains the most commonly encountered medical problems. The brief introductions should serve as an alert to the nature of the risk posed by each medical problem.

The potential diver and his or her physician must weigh the pleasures to be had by diving against an increased risk of death or injury due to the individual's medical condition. As with any recreational activity, there are no data for diving enabling the calculation of an accurate mathematical probability of injury. Experience and physiological principles only permit a qualitative assessment of relative risk.

For the purposes of this document, Severe Risk implies that an individual is believed to be at substantially elevated risk of decompression sickness, pulmonary or otic barotrauma or altered consciousness with subsequent drowning, compared with the general population. The consultants involved in drafting this document would generally discourage a student with such medical problems from diving. Relative Risk refers to a moderate increase in risk, which in some instances may be acceptable. To make a decision as to whether diving is contraindicated for this category of medical problems, physicians must base their judgement on an assessment of the individual patient. Some medical problems which may preclude diving are temporary in nature or responsive to treatment, allowing the student to dive safely after they have resolved.

Diagnostic studies and specialty consultations should be obtained as indicated to determine the diver's status. A list of references is included to aid in clarifying issues that arise. Physicians and other medical professionals of the Divers Alert Network (DAN) associated with Duke University Health System are available for consultation by phone +1 919 684 2948 during normal business hours. For emergency calls, 24 hours 7 days a week, call +1 919 684 8111 or +1 919 684 4DAN (collect). Related organizations exist in other parts of the world – DAN Europe in Italy +39 039 605 7858, DAN S.E.A.P. in Australia +61 3 9886 9166 and Divers Emergency Service (DES) in Australia +61 8 8212 9242, DAN Japan +81 33590 6501 and DAN Southern Africa +27 11 242 0380. There are also a number of informative websites offering similar advice.

NEUROLOGICAL

Neurological abnormalities affecting a diver's ability to perform exercise should be assessed according to the degree of compromise. Some diving physicians feel that conditions in which from neurological decompression sickness. A history of head injury resulting in unconsciousness should be evaluated for risk of seizure.

Relative Risk Conditions

- Complicated Migraine Headaches whose symptoms or severity impair motor or cognitive function, neurologic manifestations
- History of Head Injury with sequelae other than seizure
- Herniated Nucleus Pulposus
- Intracranial Tumor or Aneurysm
- Peripheral Neuropathy
- Multiple Sclerosis
- Trigeminal Neuralgia
- History of spinal cord or brain injury

Temporary Risk Condition

History of cerebral gas embolism without residual where pulmonary air trapping has been excluded and for which there is a satisfactory explanation and some reason to believe that the probability of recurrence is low.

Severe Risk Conditions

Any abnormalities where there is a significant probability of unconsciousness, hence putting the diver at increased risk of drowning. Divers with spinal cord or brain abnormalities where perfusion is impaired may be at increased risk of decompression sickness.

Some conditions are as follows:

- History of seizures other than childhood febrile seizures
- History of Transient Ischemic Attack (TIA) or Cerebrovascular Accident (CVA)
- History of Serious (Central Nervous System, Cerebral or Inner Ear) Decompression Sickness with residual deficits

CARDIOVASCULAR SYSTEMS

Relative Risk Conditions

The diagnoses listed below potentially render the diver unable to meet the exertional performance requirements likely to be encountered in recreational diving. These conditions may lead the diver to experience cardiac ischemia and its consequences. Formalized stress testing is encouraged if there is any doubt regarding physical performance capability. The suggested minimum criteria for stress testing in such cases is at least 13 METS.* Failure to meet the exercise criteria would be of significant concern. Conditioning and retesting may make later qualification possible. Immersion in water causes a redistribution of blood from the periphery into the central compartment, an effect that is greatest in cold water. The marked increase in cardiac preload during immersion can precipitate pulmonary edema in patients with impaired left ventricular function or significant valvular disease. The effects of immersion can mostly be gauged by an assessment of the diver's performance while swimming on the surface. A large proportion of scuba diving deaths in North America are due to coronary artery disease. Before being approved to scuba dive, individuals older than 40 years are recommended to undergo risk assessment for coronary artery disease. Formal exercise testing may be needed to assess the risk.

* METS is a term used to describe the metabolic cost. The MET at rest is one, two METS is two times the resting level, three METS is three times the resting level, and so on. The resting energy cost (net oxygen

- History of Coronary Artery Bypass Grafting (CABG)
- Percutaneous Balloon Angioplasty (PCTA) or Coronary Artery Disease (CAD)
- History of Myocardial Infarction
- Congestive Heart Failure
- Hypertension
- History of dysrythmias requiring medication for suppression
- Valvular Regurgitation

Pacemakers
The pathologic process that necessitated should be addressed regarding the diver's fitness to dive. In those instances where the problem necessitating pacing does not preclude diving, will the diver be able to meet the performance criteria?

* NOTE: Pacemakers must be certified by the manufacturer as able to withstand the pressure changes involved in recreational diving.

Severe Risks

Venous emboli, commonly produced during decompression, may cross major intracardiac right-to-left shunts and enter the cerebral or spinal cord circulations causing neurological decompression illness. Hypertrophic cardiomyopathy and valvular stenosis may lead to the sudden onset of unconsciousness during exercise.

PULMONARY

Any process or lesion that impedes airflow from the lungs places the diver at risk for pulmonary overinflation with alveolar rupture and the possibility of cerebral air embolization. Many interstitial diseases predispose to spontaneous pneumothorax: Asthma (reactive airway disease), Chronic Obstructive Pulmonary Disease (COPD), cystic or cavitating lung diseases may all cause air trapping. The 1996 Undersea and Hyperbaric Medical Society (UHMS) consensus on diving and asthma indicates that for the risk of pulmonary barotrauma and decompression illness to be acceptably low, the asthmatic diver should be asymptomatic and have normal spirometry before and after an exercise test. Inhalation challenge tests (e.g.: using histamine, hypertonic saline or methacholine) are not sufficiently standardized to be interpreted in the context of scuba diving.

A pneumothorax that occurs or reoccurs while diving may be catastrophic. As the diver ascends, air trapped in the cavity expands and could produce a tension pneumothorax.

In addition to the risk of pulmonary barotrauma, respiratory disease due to either structural disorders of the lung or chest wall or neuromuscular disease may impair exercise performance. Structural disorders of the chest or abdominal wall (e.g.: prune belly), or neuromuscular disorders, may impair cough, which could be life threatening if water is aspirated. Respiratory limitation due to disease is compounded by the combined effects of immersion (causing a restrictive deficit) and the increase in gas density, which increases in proportion to the ambient pressure (causing increased airway resistance). Formal exercise testing may be helpful.

Relative Risk Conditions

- History of Asthma or Reactive Airway Disease (RAD)*
- History of Exercise Induced Bronchospasm (EIB)*
- History of solid, cystic or cavitating lesion*
- Pneumothorax secondary to:
  - -Thoracic Surgery
  - -Trauma or Pleural Penetration*
  - -Previous Overinflation Injury*

* Spirometry should be normal before and after exercise

Active Reactive Airway Disease, Active Asthma, Exercise Induced Bronchospasm, Chronic Obstructive Pulmonary Disease or history of same with abnormal PFTs or a positive exercise challenge are concerns for diving.

Severe Risk Conditions

- History of spontaneous pneumothorax. Individuals who have experienced spontaneous pneumothorax should avoid diving, even after a surgical procedure designed to prevent recurrence (such as pleurodesis). Surgical procedures either do not correct the underlying lung abnormality (e.g.: pleurodesis, apical pleurectomy) or may not totally correct it (e.g.: resection of blebs or bullae).
- Impaired exercise performance due to respiratory disease.

GASTROINTESTINAL

Temporary Risks

As with other organ systems and disease states, a process which chronically debilitates the diver may impair exercise performance. Additionally, dive activities may take place in areas remote from medical care. The possibility of acute recurrences of disability or lethal symptoms must be considered.

Temporary Risk Conditions

- Peptic Ulcer Disease associated with pyloric obstruction or severe reflux
- Unrepaired hernias of the abdominal wall large enough to contain bowel within the hernia sac could incarcerate.

Relative Risk Conditions

- Inflammatory Bowel Disease
- Functional Bowel Disorders

Severe Risks

Altered anatomical relationships secondary to surgery or malformations that lead to gas trapping may cause serious problems. Gas trapped in a hollow viscous expands as the divers surfaces and can lead to rupture or, in the case of the upper GI tract, emesis. Emesis underwater may lead to drowning.

Severe Risk Conditions

- Gastric outlet obstruction of a degree sufficient to produce recurrent vomiting
- Chronic or recurrent small bowel obstruction
- Severe gastroesophageal reflux
- Achalasia
- Paraesophageal Hernia

ORTHOPAEDIC

Relative impairment of mobility, particularly in a boat or ashore with equipment weighing up to 18 kgs/40 pounds must be assessed. Orthopaedic conditions of a degree sufficient to impair exercise performance may increase the risk.

Relative Risk Conditions

- Amputation
- Scoliosis must also assess impact on respiratory function and exercise performance.
- Aseptic Necrosis possible risk of progression due to effects of decompression (evaluate the underlying medical cause of decompression may accelerate/escalate the progression).

Temporary Risk Conditions

oretically increase the risk of decompression sickness. Bleeding disorders could worsen the effects of otic or sinus barotrauma, and exacerbate the injury associated with inner ear or spinal cord decompression sickness. Spontaneous bleeding into the joints (e.g.: in hemophilia) may be difficult to distinguish from decompression illness.

Relative Risk Conditions

- Sickle Cell Disease
- Polycythemia Vera
- Leukemia
- Hemophilia/Impaired Coagulation

METABOLIC AND ENDOCRINOLOGICAL

With the exception of diabetes mellitus, states of altered hormonal or metabolic function should be assessed according to their impact on the individual's ability to tolerate the moderate exercise requirement and environmental stress of sport diving. Obesity may predispose the individual to decompression sickness, can impair exercise tolerance and is a risk factor for coronary artery disease.

Relative Risk Conditions

- Hormonal Excess or Deficiency
- Obesity
- Renal Insufficiency

Severe Risk Conditions

The potentially rapid change in level of consciousness associated with hypoglycemia in diabetics on insulin therapy or certain oral hypoglycemic medications can result in drowning. Diving is therefore generally contraindicated, unless associated with a specialized program that addresses these issues. [See "Guidelines for Recreational Diving with Diabetes" at www/wrstc.com and www.diversalertnetwork.org.]

Pregnancy: The effect of venous emboli formed during decompression on the fetus has not been thoroughly investigated. Diving is therefore not recommended during any stage of pregnancy or for women actively seeking to become pregnant.

BEHAVIORAL HEALTH

Behavioral: The diver's mental capacity and emotional make-up are important to safe diving. The student diver must have sufficient learning abilities to grasp information presented to him by his instructors, be able to safely plan and execute his own dives and react to changes around him in the underwater environment. The student's motivation to learn and his ability to deal with potentially dangerous situations are also crucial to safe scuba diving.

Relative Risk Conditions

- Developmental delay
- History of drug or alcohol abuse
- History of previous psychotic episodes
- Use of psychotropic medications

Severe Risk Conditions

- Inappropriate motivation to dive – solely to please spouse, partner or family member, to prove oneself in the face of personal fears
- Claustrophobia and agoraphobia
- Active psychosis
- History of untreated panic disorder

descent between ambient water pressure and the external auditory canal, middle ear and paranasal sinuses. Failure of this to occur results at least in pain and in the worst case rupture of the occluded space with disabling and possible lethal consequences.

The inner ear is fluid filled and therefore noncompressible. The flexible interfaces between the middle and inner ear, the round and oval windows are, however, subject to pressure changes. Previously ruptured but healed round or oval window membranes are at increased risk of rupture due to failure to equalise pressure or due to marked overpressurisation during vigorous or explosive Valsalva manoeuvres.

The larynx and pharynx must be free of an obstruction to airflow. The laryngeal and epiglotic structure must function normally to prevent aspiration.

Mandibular and maxillary function must be capable of allowing the patient to hold a scuba mouthpiece. Individuals who have had mid-face fractures may be prone to barotrauma and rupture of the air filled cavities involved.

Relative Risk Conditions

- Recurrent otitis externa
- Significant obstruction of external auditory canal
- History of significant cold injury to pinna
- Eustachian tube dysfunction
- Recurrent otitis media or sinusitis
- History of TM perforation
- History of tympanoplasty
- History of mastoidectomy
- Significant conductive or sensorineural hearing impairment
- Facial nerve paralysis not associated with barotrauma
- Full prosthedontic devices
- History of mid-face fracture
- Unhealed oral surgery sites
- History of head and/or neck therapeutic radiation
- History of temperomandibular joint dysfunction
- History of round window rupture

Severe Risk Conditions

- Monomeric TM
- Open TM perforation
- Tube myringotomy
- History of stapedectomy
- History of ossicular chain surgery
- History of inner ear surgery
- Facial nerve paralysis secondary to barotrauma
- Inner ear disease other than presbycusis
- Uncorrected upper airway obstruction
- Laryngectomy or status post partial laryngectomy
- Tracheostomy
- Uncorrected laryngocele
- History of vestibular decompression sickness

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11. Divers Alert Network (DAN) United States, 6 West Colony Place, Durham, NC www.DiversAlertNetwork.org
12. Divers Alert Network Europe, P.O. Box 64026 Roseto, Italy, telephone non-emergency line: weekdays office hours +39-085-893-0333, emergency line 24 hours: +39-039-605-7858
13. Divers Alert Network S.E.A.P., P. O. Box 384, Ashburton, Australia, telephone 61-3-9886-9166
14. Divers Emergency Service, Australia, www.rah.sa.gov.au/hyperbaric, telephone 61-8-8212-9242
15. South Pacific Underwater Medicine Society (SPUMS), P.O. Box 190, Red Hill South, Victoria, Australia, www.spums.org.au
16. European Underwater and Baromedical Society, www.eubs.org

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