



Ontario Underwater Council
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2010 Report on Scuba Diving Related Incidents in Ontario

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Document Control

Date	Description of Change	By Whom
Sept. 2, 2010	Created document – Birmingham Crane, Sept. 1st	Scott Holmes
Sept. 3, 2010	Rewrite Sept. 1st incident	Scott Holmes
Oct. 24, 2011	Revised Sept 1 Incident based on Coroner's Report	Dave Noble

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Submitting an Incident Report

To submit a report, you should contact one of the ***OUC board members***.
You can also complete and return an ***Incident Submission Form***.

For comments on this document please contact

OUC's Director of Sport Safety
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Ontario Underwater Council

2010 Report on Scuba-Diving Related Incidents in Ontario

Foreword:

The primary goal of this Ontario Underwater Council (OUC) report is to **prevent future scuba diving incidents**¹ by collecting, analyzing, and sharing information about past scuba diving incidents.

So as to ensure the greatest possible benefit to the Ontario Scuba Community, OUC's goal is to share the information on fatalities in Ontario as collected and any recommendations on OUC's website at: <http://www.underwatercouncil.com/?action=cms&cmspage=safety> within 72 hours.

Recommendations are not intended to be a comment or conclusion on the cause or causes of the specific incident.

With regards to "Near Misses", the OUC reserves the right to select incidents for publication.

Disclaimer:

No claim is made by the OUC, the Director of Sport Safety or by any contributors, as to the completeness or accuracy of information contained within this report. Every effort has been taken to include only respected sources in the public domain, however it must be stated that none of these have been independently verified or investigated.

Certain personal risks are inherent in most sports, and the sport of scuba diving is no exception. By engaging in the sport of scuba, you accept these risks. No amount of training, experience, equipment, policies, etc. can completely eliminate all personal risks, and the OUC, its Board Members, Regional Coordinators, and Members are not responsible for any losses, injury, or death sustained as a result of members or non-members taking these risks.

¹ Incidents are divided into 2 categories, "Fatalities" and "Near Misses"

SECTION A: Fatalities - Summaries & Recommendations

Fatalities - Summaries and Recommendations are listed in chronological order.

Date of Incident: 2010-09-01

Summary:

Dive Accident of 2010-09-01

On Wednesday, September 1st, 2010, a 37 year old man, Todd Fisher, died while scuba diving at the Birmingham Crane wreck at a depth of ~145' in Lake Ontario near Oakville.

OUC was notified of the death that afternoon, and on September 4th, OUC published a brief summary in its "72-hour Incident Report", with recommendations to be added at a later date.

In February of 2011, the Office of the Chief Coroner notified OUC that their investigation into the death was complete. Arrangements were made for the Regional Supervising Coroner to meet with OUC to share the findings of the coroner's investigation to support potential recommendations and to discuss communication of the findings, and OUC's recommendations to prevent recurrence, to the greater Ontario scuba community.

The following case summary was developed from information provided by the Regional Supervising Coroner:

On September 1, 2010, the decedent, a dive companion and another diver planned and commenced a recreational dive. They planned to dive to the Birmingham Crane wreck lying on the bottom of Lake Ontario near Oakville. Two of the divers were directly involved in the incident, each was described as experienced, the companion being more experienced than the decedent. The divers had completed previous dives together. The decedent was using a Nitrox gas mixture. The companion was using a mixed gas rebreather. A third diver planned to remain with the boat while the decedent and dive companion completed the dive.

The dive plan was for an 8 minute dive to a maximum depth of 130 feet. The dive commenced at a descent rate of 33 feet per minute, traveling down along 100-120' of anchor line.*

**Note: OUC records show that the Birmingham Crane Wreck lies in ~145' of water, therefore the length of anchor line as reported appears to have been incorrect.*

Light signals were used for communication between the divers. The dive companion stated that the OK signal was exchanged between the two divers as they reached the desired depth. The dive companion described looking forward towards the wreck, and then on looking back to the decedent, who was then showing signs of panic

As the companion approached the decedent he noted the regulator was out of his mouth. The dive companion purged the back up regulator and placed it in the mouth of the decedent. The decedent apparently took 3-4 breaths. This was repeated 3-4 times. The decedent exhibited movement that the dive companion suspected to be seizure activity. The decedent knocked his mask off at this point.

The dive companion deployed his back up bottle (reported composition 21 % O₂) and the decedent took 1-3 breaths. The decedent experienced a convulsion at this point. There was no regulator used by the decedent after this. The dive companion described difficulty with achieving buoyancy trying to aid the decedent and ascend with the decedent. It was not until the decedent went limp after the seizure that positive buoyancy was achieved.

At a depth of about 70 feet the dive companion and the decedent began to ascend quickly. The dive companion described pinning the inflator open and pushing the decedent toward the surface. The dive companion stated he knew the decedent was likely deceased and knew his life was in jeopardy if he did not release the decedent.



Rescue request was signalled as the decedent came to the surface. The dive companion made safe ascent up the anchor line.

Dive time was recorded as 24 minutes. A fishing boat in the vicinity responded to the signal and emergency personnel responded promptly.

Past health history noted no major medical illness and no regular medication use. He was described as a non smoker and never drank alcoholic beverages in the 24 hour prior to a planned dive.

Post-mortem examination revealed no evidence of natural disease and no evidence of injury other than barotrauma of macroscopic and microscopic nature. Computed tomography (CT) examination revealed intra-arterial air in the heart, lungs, neck and head. Bullae and pneumothoraces were noted in each lung with subcutaneous emphysema on the anterior chest wall at the nipple line and up to the neck and head. Tympanic membranes were intact and no petechiae were noted on the face. Carboxy-Hb testing was negative. Toxicologic testing including for ethanol was negative.

The dive shop tank filling system was reviewed and no concerns were identified. The decedent had filled his own tanks prior to the dive. Evaluation of gas samples submitted from the shop was satisfactory.

The decedent's scuba equipment was examined by police dive experts and was deemed to be intact, operational, and free of damage.

Data was downloaded from the decedent's dive computer and plotted by proprietary software. The computer plot revealed the maximum dive depth to be 42.75 meters (42.75 metres = 140 feet) and the duration of the dive to be 7.54 minutes. The decedent appeared to have reached the maximum depth at 3 minutes 20 seconds into the dive. Over the next 4 minutes of the dive, there appeared to have been fluctuation in depth with several sharp ascents and descents (up to 7.03 meters) until the final ascent which commenced at 7 minutes 20 seconds into the dive.

Tank Gas Analysis was completed. One of these tanks belonged to the dive companion. It could not be analyzed as it was empty. The decedent's rescue tank was not deployed.

Analysis of the decedent's right and left bank tanks revealed Oxygen / Nitrogen concentrations of 29.0% / 70% (right) and 29.1% / 70% (left).

It is believed that oxygen toxicity was the most likely cause of the initial symptoms that were witnessed by the co-diver. The decedent was witnessed to have taken several large breaths from the co-divers' rescue tank. The several sharp ascents and descents over the next 4 minutes of the dive would have been sufficient to create barotrauma and air embolism to cause death. As the decedent continued to ascend, the barotrauma and air embolism became more extensive.

The cause of death was listed as "Air Embolism due to Barotrauma in a Scuba Diver with Acute Oxygen Toxicity". This death was classified as "Accidental".

*A review of current standards for diving with gas mixtures rich in oxygen revealed the published limits for ppO₂ exposure are between 1.2-1.6 bar. Most experienced divers stay below 1.4 bar to avoid the risk of developing oxygen toxicity. Symptoms of oxygen toxicity vary but can result in seizure activity and sudden loss of consciousness. The ppO₂ the decedent was exposed to at his maximum depth was **1.49** bar. It must be noted that thresholds for development of oxygen toxicity may vary with each individual diver, and may also vary from one day to the next.*

For public domain information of this incident, please refer to Section C, Appendix #1 of this document.

OUC Recommendations:

1. OUC recommends that all divers plan their dives and dive their plans conservatively, and that limits (whether for air, nitrox or other) be viewed as things to stay away from, not as goals to be attained. Diving on nitrox involves a trade-off; the decreased nitrogen content means divers can dive longer and more comfortably (due to reduced nitrogen absorption & narcosis), but the increased oxygen content means they cannot dive as deep (due to the toxicity of oxygen at higher partial pressures).

To guard against oxygen toxicity, some training agencies teach the use of two depth limits. The first is referred to as the "maximum operating depth" (MOD) and is usually the depth at which the partial pressure of oxygen (PPO₂) in the breathing gas reaches **1.4** bar. The second, deeper, depth is referred to as the "contingency operating depth" (COD) and is usually the depth at which the PPO₂ in the breathing gas reaches **1.6** bar.

These depth limits are, as with all tables, theoretical, and do not preclude the possibility of getting a Central Nervous System (CNS) oxygen toxicity hit. Diving close to, at, or beyond these depth limits increases the diver's risk of a CNS O₂ hit, an extremely dangerous condition as onset is often without warning and may be followed by seizures, unconsciousness, drowning, and death.

2. OUC recommends the following protocol provided by the Divers Alert Network Medical Information Hotline for rescuing a diver that is experiencing a seizure (whether for Central Nervous System Oxygen Toxicity or other reasons) be followed:
 - a. The rescuer must always make their own personal safety their highest priority
 - b. The rescuer should try to provide an uninterrupted supply of breathing gas to the seizing diver at all times.
 - c. The rescuer should try to maintain the seizing diver at the same depth during the tonic-clonic (intense and repeated muscle contraction-and-relaxation cycles) phase of a seizure. Reason being, during this phase, the seizing diver's glottis (airway) may close, and changes in depth during this time could lead to barotrauma (lung squeeze or lung overexpansion and embolism).
 - d. Once the seizing diver has lost consciousness, the glottis opens, and the rescuer should ascend with the unconscious diver to the surface at the recommended ascent rate, maintaining air supply throughout the duration of the ascent.
 - e. Once at the surface, the rescuer should re-evaluate and take appropriate action.
3. OUC recommends that divers hydrate and fuel up (eat) appropriately before diving. This is important as it relates to the physiological ability of the body to handle workloads, cold temperatures, dehydration and thus the predisposition to oxygen toxicity and DCS.

SECTION B: Near Misses - Summaries & Recommendations

Definition of a “Near Miss”

A “Near Miss” is any scuba-related situation or incident that did not result in a fatality, but that did put the diver/s health and/or safety at risk.

To report a near miss and submit it for consideration for publication in this report, please send an e-mail to ouc.safety@underwatercouncil.com with all relevant details.

Date of Incident: 2010-mm-dd

Summary:

TBD.

OUC Recommendations:

- *Recommendation 1*
- *Recommendation 2*



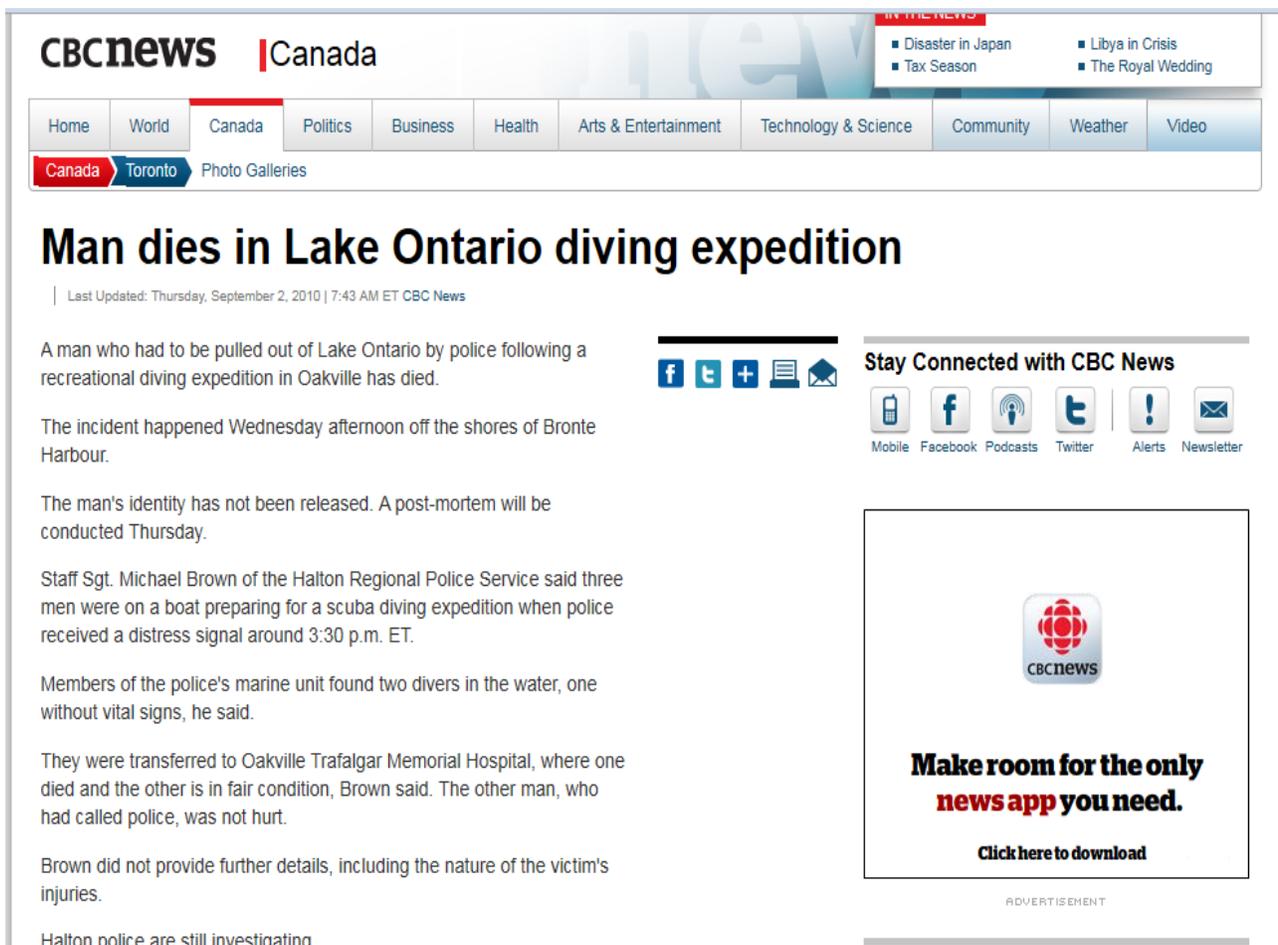
SECTION C: Appendices

Appendix #1

Public Domain Information on Scuba Fatality of 2010-09-01:

The following reports are preserved as posted online by reputable news agencies. The “facts” as written may contradict details of OUC’s report. OUC endeavours to collect its information from sources as close to the incident as possible, and records media and other publicly available accounts for reference only.

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Man dies in Lake Ontario diving expedition

Last Updated: Thursday, September 2, 2010 | 7:43 AM ET CBC News

A man who had to be pulled out of Lake Ontario by police following a recreational diving expedition in Oakville has died.

The incident happened Wednesday afternoon off the shores of Bronte Harbour.

The man's identity has not been released. A post-mortem will be conducted Thursday.

Staff Sgt. Michael Brown of the Halton Regional Police Service said three men were on a boat preparing for a scuba diving expedition when police received a distress signal around 3:30 p.m. ET.

Members of the police's marine unit found two divers in the water, one without vital signs, he said.

They were transferred to Oakville Trafalgar Memorial Hospital, where one died and the other is in fair condition, Brown said. The other man, who had called police, was not hurt.

Brown did not provide further details, including the nature of the victim's injuries.

Halton police are still investigating.

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Appendix #2

Public Domain Information on Scuba Fatality of 20yy-mm-dd: