

Fire Service Dive Rescue & Recovery by Larry L. Pierson

Over our evolution as a fire service we started as a focused group concerned with suppressing fire and rescuing citizens. Many communities recognized their recently formed FD as the only organized group to turn to in time of need for a variety of reasons and emergencies.

Leaving our crosslays packed and pumps in road gear at times over the years, we have formed teams and training to battle a plethora of specialty rescue and other community needs. Some of these have been reactive after an unusual incident has occurred in your district or your neighboring departments. Proactive responses may have come from a member's initiative or after a hazard analysis has been conducted and an area or function found lacking.

Keep the following information from a 2002 CDC study and fact sheet in mind while assessing your district or thinking of the existence of dive resources in your department:

Center for Disease Control (CDC) 2002

- 3,145 died from home fires in the US in 2003 (*This does not include fire related deaths other than residential*)
- 3,447 drowned in the US in 2002, >9 per day. (*Includes drownings of all types*)
- Drowning remains the second-leading cause of injury-related death for children ages 1 to 14 years
- "As children get older, drownings often occur in open water areas such as ponds, lakes, and rivers"



Dive rescue exercise - Lake Summit, Henderson County. Green River, Saluda and Swannanoa Fds. Left-Tim Ray, Divemaster GRFD, Right-Pierson

While some of these drownings from infants occurred in bathtubs and buckets, other young age ranges occurred in pools. From several sources of information, it appears that an alarming number of drownings occur in bodies of water such as lakes, ponds, streams & rivers.

Justifying dive resources - Hazard Analysis

Counting bodies of water and estimating their size and depths would be a good start. If the water exists, then a drowning can occur. Your personal knowledge of these lakes, ponds or streams or a drive around the district may discover some you were not aware of. Local government may have sets of aerial photos, online access to GIS (*Graphic Information Systems*) that along with other online sites may let you spot a body of water that members were unaware of.

Next you should look at what functions occur on or around the body of water and the frequency. Lakes or ponds near recreational parks for baseball for example are bound to attract the curiosity of youth while the parents are distracted watching their other child's game. Campgrounds containing lakes may have paddle boats, canoes and other functions that place several people on the body of water at one time. Obviously large lakes where boating and fishing are commonplace pose a high potential for dive rescue needs. Any body of water that can freeze over will eventually have someone playing hockey with sticks and aluminum cans. I did it growing up, a lot of fun, but just lucky we never fell through the ice.

Justifying dive resources - Resource availability

It is certainly true that most cases involving FD Dive teams involves a recovery of victim and not their rescue. The individual drowning has a very short time frame of survival or revival during patient care. If so many cases involving dive teams are recovery operations, how many are because of delayed reporting, lack of dive resources in the district or delayed action by the FD while gathering their equipment?

Depending on response times, a neighboring department may maintain a dive rescue/recovery team that can positively effect the outcome during a drowning incident. Beyond that range, you are most likely looking at calling resources from other areas that will assist with a recovery.

A common assessment of resources may include knowledge that "So & So FD has a dive team.... they will come". For what we owe to citizens within the community, consider that response times by dive resources should be similar to how we perceive response times to MVAs and other time crucial events.

Justifying dive resources - Financial

Dive training & equipment cost money just like any other function in a FD or Rescue Squad. Not every department has the budget to venture into other avenues they wish they could. Having an internal and qualified dive instructor saves money in the future but will be a rare resource in most departments. Arrangements with local dive shops can help with discounted courses but may be limited to recreational training and can't provide the Public Safety Diver realm of training afterwards.

Any presentations to start or keep a dive program should include real fact and data. Hazard analysis, resource availability, cost analysis, and support from various members are absolutely necessary to come together for success. Presentations containing skewed fact or data are almost doomed to fail. If you are the one bringing forth the program, justify to yourself first.

All of water related services combined

Basic water rescue, swiftwater rescue, ice rescue and dive rescue all have common denominators. They all include water, some equipment can be used in all of them cutting costs, the same members will generally be interested and the first three can help make sure the dive rescue will be infrequent.



Lt. Dewain Stamey, Swannanoa FD, during Rescue Diver course. Photo by L. Pierson

If you pursue dive rescue within your department, make sure not to put all your eggs into one basket. All of these water rescue functions should be progressive. Don't focus totally on dive equipment when the person could be quickly rescued at the surface before they go under.

A surface rescue can be initiated while others are preparing dive equipment for a quick retrieval in the event the person goes under. What happens when the ice rescue

changes to dive rescue when then person slips under the ice? The main point is don't focus only on dive rescue. If you justified your area to have a dive rescue team, the community also needs the other water rescue functions.

Equipment

Public Safety diving equipment could certainly have it's own article to cover all the possibilities and opinions in the dive rescue community. But here are a couple tips.

- Expensive isn't always better but "cheap" also refers to quality on some gear. Look at fact and data, not marketing and sales pitch or who uses what. Ask for a demo or try the different gear out before purchasing, get input from your divers. Interview other users, just make sure they feed you a real evaluation of the gear, not just an opinion.

- Vest/jacket style or rear inflation BCDs? (Buoyancy Control Devices) Different opinions are out there but either works with pros or cons either way and I have dove with several brands with both styles. Just make sure your BCD has multiple connection points, retractors to minimize loose gear, storage space, durable, comfortable, easy to use and adequate lifting capacity. Having a gozillion pounds of lift capacity doesn't make it a great BCD. Match the lifting capacity to your needs.

- Additional note on BCDs - All divers dive with an alternate air source! The best and recommended is an independent system with it's own small tank (*Pony bottle*), 1st stage regulator and a 2nd stage regulator that you breathe from in an emergency. BCDs that have an inflation hose with a built in 2nd regulator may cause some problems and should not be considered an alternate air source. Imagine your primary regulator (*the one a diver breathes from normally*) fails, you go to your second regulator installed on the inflation hose and begin to ascend. The regulator now in your mouth is attached to the device that you need to use to control your buoyancy (*by letting expanding air out of the BCD so you don't ascend to quickly*) while ascending which must be elevated to release air. During an emergency you will have to remove the regulator from you mouth to control ascent, not the type of action needed during an emergency. These devices also make it difficult to aid another diver because of their length.

- Dive computers - A must in low vis conditions and great for tracking dive profiles. Remember, you can't let divers switch computers. The computer is tracking an individual's nitrogen buildup or oxygen saturation

depending on the breathing gas being used. Any diver should know how to use the basic dive tables and when teams must switch gear, you should rely on tables logging the max depth, bottom time and recording each members activity on a master log form by a divemaster or supervisor.

Full Face Masks & exposure suits

Full face masks cover the entire face, sealing the mouth, nose and eyes from bacteria, biological agents and other contaminants. Even around a recently submerged boat or a car that has entered a body of water, you can expect fuel, oil and other products. The major con for a FFM is cost and some other issues of visibility, ease of clearing the ears and bulk of the unit depending on brands. Costs range from \$500 to \$2000 or more depending on brand and options. One of the pros that will become immediately evident is very cold water not touching your face and increasing your breathing rate and temperature loss (*I really like that one*). Fogging is virtually nil as the only air that passes through the mask is dry compressed air from the tank. I have to admit, even during recreation only type diving I will prefer a FFM any day.



A Full Face Mask, drysuit with sealed gloves, integrated communications and light system.

The drysuit also seals and protects the skin and allows a diver to wear other clothing underneath such as polar fleece, street clothing or duty uniforms. Just remember to remove badges, namebars and collar brass.

The drysuit is quick to put on, works for other operations during swiftwater or ice rescue but there are some drawbacks. Costs can be from \$1,000 to \$1,500 for a decent quality suit and there are maintenance procedure that need to be performed on the seals, zippers and inflator valves.

Wetsuits (neoprene) allow water to occupy the space between the skin and material. A properly fitting wetsuit doesn't constrict a diver or fit too tight, while at the same time does allow water to enter the suit. The principal of why wetsuits work is that the body warms the water between the layers and the neoprene controls the temperature loss. If the warmed water is able to stay, you will stay warm. They are less expensive but still must cover the size ranges of your team and are a cost factor but less of one. Potential of exposure to contaminants still remains a hazard.

There are still several areas to look at regarding equipment such as communication units, gauges, fins, reels and others but evaluation of those type can come through training time.

Basic Ideas for Dive rescue Response

Equipment readiness

How quickly could you be in the water? Initially we are looking for two equipped and trained divers to perform most rescue situations (*not recovery*). Primary diver and Safety diver. Since many patterns discussed shortly are conducted with one person in the water (*the primary diver*), a Safety is on shore or in boat and is 90% ready to enter the water to assist or rescue the primary diver.

Some ideas for better readiness have been solved in fire departments by owning dive trailers that can be quickly attached and responded or by responding heavy rescue or rescue vehicles which have the equipment onboard. In an enclosed cab of a heavy rescue you would be surprised at what gear you can don while still wearing your seatbelt. Wet or drysuits can be donned enroute leaving only the BCD/tank setup to put on upon arrival and then fins. Training is key and seatbelts are mandatory.

If all your gear is stored at the station and it must be loaded, you may be looking at too long of a response time to justify dive "Rescue". At least prepare a way that 2 sets of gear can be immediately deployed for your primary & safety diver while other equipment is on the way.

First on scene

Good information on the initial phone call can save some crucial time. Accurate description of the location the incident occurred and a department's knowledge of their district maps and access points are needed.



FF Sara Wilson, Swannanoa FD, acting as a witness/spotter during a rescue training exercise.

Hopefully the incident is witnessed. One member interviews the witness for incident time, where they went into the water or where they went down, color of clothing, size, and how many victims are involved. Reference points are noted and locations marked. A vehicle in the water will leave a few more tell tale signs such as an oil slick, muddy water and a few bubbles. Unwitnessed events and situations that indicate a longer down time may already be placing your team into recovery mode and not rescue. Always perform a "Risk vs. Benefit" analysis.

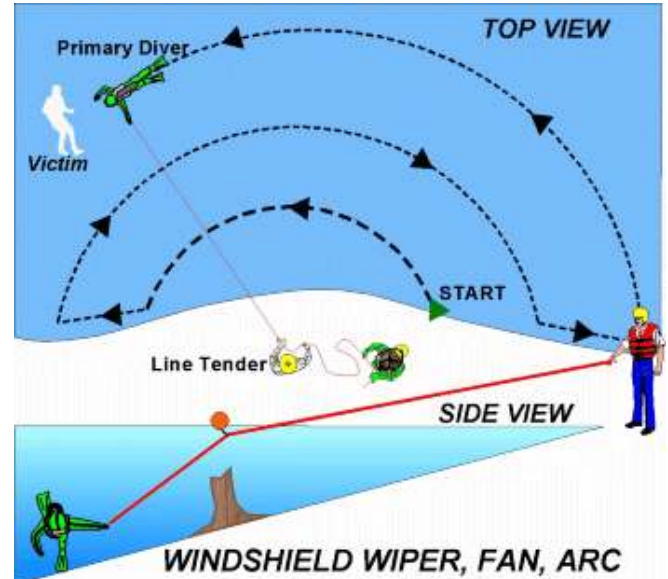
One drowning incident that occurred in our district was conducted as a rescue operation. Witness stated it had "just happened". The victim was recovered quickly but could not be revived. Later interviews with the witness put the time range more towards 45 minutes to an hour before it was reported. If a witness has consumed alcohol or is just in a panic mode, the accuracy of information may be quite skewed.

Search Patterns

We will show three basic search patterns but there are more and several variations of these three. Consider these issues when selecting a pattern. Clothing color and size of the victim, Visibility, Number of divers needed to use the pattern and vegetation and terrain features, speed of implementing the pattern and its complexity. Beyond any considerations, safety of your divers comes first!

Windshield Wiper

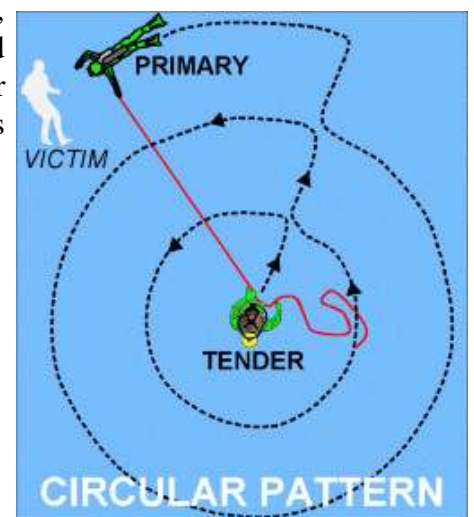
Also known as the "fan" or "arc", this pattern requires only two divers (*Primary & Safety 90% ready*), is quick to deploy, with minimal complexity. Only one diver performs the search which minimizes confusion in poor visibility. The tag line is held in the hand and the diver keeps tension while moving forward. Line signals switch directions and spacing. The distance between each arc will depend on factors described in the first paragraph. Each pivot point is marked and the next set of arcs will overlap part of the previous set.



Graphic by L. Pierson

The Circular Pattern

Requires two divers and both are in the water which slightly increases complexity. The pivot diver settles solidly on the bottom, remains facing one direction. As the Primary Diver completes a circle, the pivot signals, line is extended and a larger circle sweep is conducted.



Graphic by L. Pierson

The Alley Search

Requires more divers in the water in a coordinated effort, time to set up, more equipment for the setup and an increased complexity. This is not a rescue pattern, only used for recovery efforts. The divers use a guideline making a forward sweep along the bottom through an "alley" created by weighted lines placed on the bottom. After the alley is completed they shift to the next alley and search the other direction.



Graphic by L. Pierson

Training

One of the important aspects of a dive rescue is the recognition between recreational diving and Public Safety Diving. I have read some articles and heard opinions that recreational dive training is of no value to a public safety diver and their programs. I would beg to differ. Basic SCUBA skills that are developed during your first recreational Open Water course or Advanced Diver become a foundation that a diver should repeat and refresh. If you look in depth at NIOSH reports, some of the basic skill sets, if well established, may have aided in preventing some fatalities or injuries. There are many advanced skills that come after these courses and training specific to a public safety diving but they cannot be safe or effective without the basics.

Recreational courses also allow for some fun, specialty courses to find a niche for each person and some knowledge that will help understand advanced training that will come. Aside from PSD sessions, the more a diver dives the better their skill sets can become. The recreation

training progression system allows focus on skill by skill instead of task loading an individual. If we are teaching an Open Water class (*entry level class*) to potential PSD divers, we don't treat them like PSD divers in the course. Time one on one with students allows confidence building and skill progression. Some individuals may be turned away from diving forever if pushed too quickly. Some dive students may not eventually like the PSD world, searching in 0' visibility, searching for bodies or comfort levels in ponds and lakes. That is OK. What you have trained is a knowledgeable line tender or surface support person for those who choose the PSD level.

As students progress it is important to identify to each dive team member that these beginning scuba courses do not qualify them for PSD diving. Your SOGs should outline training prerequisites and refresher requirements for service.

Training Agencies

I have grown up through the PADI (*Professional Association of Dive instructors*) development system and have been quite pleased at the knowledge and skills I was given, training materials provided and opportunities for continuing education programs. Other divers and instructors I have spoken to were just as pleased when they went through the NAUI (*National Association of Underwater Instructors*) programs or SSI (*Scuba Schools International*) all of which I have respected throughout my career.

The key factor seems to always come down to the quality, knowledge and skills of the instructor not necessarily which agency they represent. Search the web for some information on what to look for in an instructor and let that guide you and your department.

Training provided by agencies that specifically target Public Safety Diving are out there as well. Check details in NFPA 1670 to make sure their programs cover the standard, interview other teams that have taken their training and call the instructor to discuss the course with them. A key question may be asked during team formation. Is there an OSHA standard that refers to dive rescue operations? Yes, but it is an exemption for rescue and recovery work by a government agency as specified in 29CFR 1910.401(a)(2)(ii). However, there are some details that I would recommend implementing from 1910 Subpart T, Commercial Diving Operations. They are just common sense safety issues whether required or not.

Summary

If you have interest in pursuing a dive program make sure you really have the justification for it or it will fail eventually. Train as much as possible but remember all the other functions that your department performs to. Constantly review accepted standards, maintain equipment readiness and encourage people to be involved as support staff. Don't forget to have fun diving sessions and several training sessions can be entertaining while building skills at the same time.

Beware of your dive team being used to perform types of maintenance work for people or businesses. Although it may seem like good PR for the team, there are hazards present in some of these situations that need specific training and not to mention you would be switching into roles that may require standards to be met from OSHA as commercial divers.

Good luck with your team and I'll leave you with a quote when deciding to implement a justified dive program.

"We are not put on this earth for ourselves, but are placed here for each other. If you are always there for others, then in time of need, someone will be there for you"

-Jeff Warner



Larry L. Pierson Jr. - *Deputy Chief of the Swannanoa Fire Department in Buncombe County, PADI Master Scuba Dive Trainer*



Dive rescue training exercise - Capt. Doug Gregory, Swannanoa FD