I started my fire service career in 1995 and quickly found that I had a knack for technical rescue. In 2011, I became an officer and was initially responsible for training and drills. I had been a Pennsylvania State Fire Instructor since 2005, so training was nothing new for me. What was new territory was having to come up with a weekly plan for training/drills. Is there a difference between training and drill? The answer is, Yes. Simply put, training is a formal lesson on a given subject where the students may not have a mastery level of that task. Drills are instruction or training on a skill that a student already has mastered. Some of the basic fundamentals of teaching include writing a lesson plan, developing the curriculum, designing the PowerPoint, preparing training aids, and, of course, having the right instructor who has the knowledge, skills, and abilities to deliver that level of training. I also asked myself, is there a difference between the person/officer conducting the training in the fire house versus a state fire academy instructor conducting a formal class? If we are doing hands-on rope rescue training, does there need to be a rescue plan? Is there a difference between rope rescues training 50’ in the air, versus a real world rescue 50’ in the air? The answers are Yes and No.

Ultimately, there are similarities and small differences. First, if you are conducting training or running a drill in a fire house, you still need to develop some type of plan on paper. This training plan can be less formal than a lesson plan used for basic fire training, for example. For your In-station training/drills, you may want to address the goals, objectives, student outcomes, etc. You may also need to address a safety plan, rescue plan, and first aid depending on the subject and hazards associated with the training. Again, this can be less formal but you should still have some plan on paper. This will give you guidance in your plan and ultimately help ensure you are following that plan. Using the high angle rope rescue training as an example, at the end of the day, the only difference between being suspended in the air on rope for training or a real world incident is time. In training, we have all the time in the world to plan and prepare. Real world incidents don’t allow us all the preparation the world, but in training, we have the luxury of minimizing hazards and reducing risks through proper planning. We can learn from our training and apply that information and knowledge to live incidents. Train how we fight, as I have had people tell me. If, in training, we have the luxury of minimizing hazards and reducing risks, then why have we lost and continued to lose our brothers and sisters in training? Breaking it down to the common denominator, if you fail to plan, you plan to fail. We can train and train all day long and hopefully, if you’re training properly and learning from your mistakes, you will then apply that new knowledge when you encounter such problems in a real world incident. In December 2012, I started to research why people are dying in training and how we can prevent it in the future.
I started my research on training fatalities involving first responders conducting some type of rappelling/rope rescue training. From December 2012 until February 2015, I contacted the investigating authorities of each of these fatalities to get copies of the reports. In most cases, I was able to get copies of the fatality report through professional cooperation from the respective agency. In other cases I had to write and request copies of the reports through public record request or under the Freedom of Information Act (FOIA). Nonetheless, by February 2015, I had copies of the reports and was able to compare each case study and look for common denominators. Though these fatalities occurred while training, they were all considered line-of-duty deaths (LODD).

The National Institute for Occupational Safety and Health (NIOSH) is the U.S. federal agency that conducts research and makes recommendations to prevent worker injury and illness. The NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) conducts independent investigations of select fire fighter line-of-duty deaths. The purpose of these investigations is NOT to find fault or blame but to provide recommendations to prevent future deaths and injuries [NIOSH]. Following the same direction and process of the NIOSH Fire Fighter Fatality Investigation and Prevention Program, I started to research and meticulously review each case by reading the investigation and the medical examiners reports. I also reviewed the photos and video that were provided with some of the reports. In doing this research, I was able to put together a spreadsheet of the contributing factors that led to the fatalities. Interestingly, I came up with five common denominators that I am calling the “Focus Five.” To ensure neutrality, the departments and individuals will remain nameless. Below are the Focus Five in no particular order.

Lesson #1 – Safety
The first trait that is consistent with all the case studies is safety, or lack thereof. Looking at the case studies with regards to safety, the common theme is that they lacked one or more of the following: 1) Failure to provide and identify a safety officer. In some cases there was a safety officer, but that person was never clearly identified. 2) Failure to conduct a safety briefing before the training evolutions. Though briefings did occur in some of the cases, not all of them addressed safety. 3) Failure to provide a competent and/or qualified instructor to oversee the operation. “Competent” means a person “who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them” [OSHA]. “Qualified” means a person with “specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control” [OSHA]. We may define a competent person as a safety officer who ought to have the background for the area he or she is supposed to be identifying as unsafe conditions or practices. We may interpret “qualified” as a recognized instructor in that specific area who is not only qualified to perform that task or job, but is also qualified to teach it. Of course, each department, agency or Authority Having Jurisdiction (AHJ) may have its own definition or requirements for an instructor, but overall, the requirement is the same. The person instructing needs to be qualified to do so. 4) Failure to conduct a primary and/or secondary safety check of the systems and system components as well as the equipment and PPE of the victim(s). When you are training, teaching, or the one rappelling, the culture should be such that anyone can check or double check to ensure safety. A good instructor should not get offended by a student or another instructor checking his or her work, especially when it comes to high hazard rope
training. That should be seen as a much needed level of redundancy, which is something we should be accustomed to in the fire service. I’ve been hearing my entire career that everyone is a safety officer, but I can tell you that if the culture does not allow for that training, then not everyone is, in fact, a safety officer. It should be noted that in just about any training near miss or fatality, lack of safety could potentially be the consistent factor that led to the incident. As far as we’re concerned for these incidents, the four deficiencies outlined above are the lessons learned and the areas that need immediate improvement.

Lesson #2 – Training

Most of the cases lacked proper training. Additionally, the rope or rappel instructor was not qualified to supervise these techniques. In some of the cases, the victim had little experience and the instructor or person overseeing the training was equally untrained. In many of these cases, the instructors, “Did not know, what they did not know.” They had enough experience and education to perform that skill under the direction of someone with a greater level of experience but not enough to oversee that training alone.

In one case, the person overseeing the evolution “supervisor” was not qualified to do so. The supervisor had little training in the mechanical device being used. The supervisor trained one of the responders in the device. By this point, the victim had little information that was accurate and even less information on using the device properly. A mechanical device with 7/16” NFPA static kernmantle rescue rope was being used, but the device was designed and tested for ½” NFPA static kernmantle rescue rope. In this case, the lack of proper training on this piece of equipment combined with using the wrong size rope would be one of the contributing factors to this fatality. In another case, the team members told their command staff they were doing one type of training but, in fact, did something different. They were doing what’s called a buddy rappel. In this case the rappeller, a male, had a “buddy” on his back and was going to rappel a 50’ tower on one rope with no safety (belay). They were using 7/16” braided rope and combined they both weighed over 400 lbs. From the beginning, the person rappelling was struggling to maintain position due to the weight. As the person rappelling moved side to side, so did the rope. Eventually the rope moved off a railing and onto a sharp object, which caused the rope to separate. Both people fell to the ground and one person died.

Ultimately, after reviewing the investigation report, the findings cited a number of failures including not informing the command staff of the intended training, not having a qualified instructor to oversee the buddy rappel, using the wrong type of rope (which will be addressed in Lesson #4 Equipment), and not having proper training in the railing system that the rope was run over. Additional issues were cited in this report, but at the end of the day, what they were training on was outside the scope of their level. They were training for an upcoming competition, and no one in the command staff knew they were going to do a “buddy rappel.”

In many of the other cases, the personnel participating in the rope evolutions had no training while others did. In another case, it was never made clear if the evolution was a drill or training. It was unclear who had what level of competency. As an instructor, if I know I am running a drill on a given task, ideally I know that the people participating have already received a formal block of training in that task. If not, I need to adjust my drill plan to account for that. I may write a lesson plan that would allow for training and drilling at the same time and increase my student-to-instructor ratio. This would allow me to train people who have never conducted this task while being able to drill with the individuals who have already mastered the given task.
Lesson #3 – Communications

Communications was also an integral factor in these incidents. A main finding regarding communications was the failure to effectively communicate with the team members on the training evolutions. This breakdown included not properly educating the team members of the training goals and objectives. Another failure included lack of proper communication with the chain of command as to the type of training that was being executed. Other areas of poor communications include failure to conduct briefings and assign roles and responsibilities. In some cases, this lack of clarity has been clearly identified as a deficiency.

Two cases stick out in particular. One of these incidents was helicopter related. Though a helicopter may only account for a small percentage of rescue services in the US or worldwide, the lessons learned are invaluable. A group was doing a helicopter rappel demonstration for a public event. The crew practiced the rappel a number of times prior to the demonstration. All previous drills on this evolution required them to rappel out of the helicopter, get to the ground, and come off rope. Other ground personnel would secure and walk back holding the rope as the helicopter would land from the hover. This is a common helicopter rappel practice, especially in the military. The ropes are secured by ground personnel to make sure they do not get tangled up within the helicopter as it lands.

For the public demonstration, a decision was made to cut the ropes following the rappel. This decision was made just before the demonstration and had not been practiced or readily talked about. To complicate matters, it was decided that both the rappel master and helicopter crew chief would cut the ropes simultaneously. The individual’s rappelling dropped the rope out of the helicopter, and the victim’s rope became entangled on the helicopter skid. As the three remaining rappellers descended the rope, the victim was hung up due to his rope being entangled. One of the crew who was previously identified to cut the ropes did just that on the left side. The other member also cut the ropes but failed to look out the right side and ensure both people rappelling made it to the ground safely. The post-accident investigation revealed that the discussion to cut the ropes was made just before the demonstration, but it was not clearly identified who was cutting what ropes. It was never definitively communicated how they were going to determine when it was safe to cut the ropes. Sadly, no one ever looked out the right side of the helicopter to verify the ropes were safe to be cut. They had never discussed verbal or non-verbal signals. They had never discussed utilizing ground support people as a second or third set of eyes for safety. Once the ropes were cut, the victim had fallen approximately 75’ and succumbed to his injuries.

Another special case involved a combination of a breakdown in communications and failing to check the equipment. This case involved a mountain rescue team. Following a successful evolution utilizing a Stokes basket and attendant, the ropes (main and belay) were pulled back to the roof top and “re-set” for the next evolutions. The crew rotated and reset using a live victim in the Stokes. Once the rescuer and Stokes basket was lifted over the parapet wall, the crew attempted to transfer the weight of the load onto the rope system.

The crew lost control of the load because it was never transferred to the rope. In fact, the load (Stokes basket with a live victim and a rescuer) had started to fall and one of the crew members held onto the Stokes basket. All three people fell to the ground, approximate sum 45’. One victim was fatally injured and two others suffered career ending injuries. Post-incident analysis revealed that the cause of this incident was the failure
to properly re-set the system. The crew had pulled the rope back on the roof top of the tower for the next evolutions. No one ever re-set the rope through the descent control device or belay. Essentially, they had fifty feet of rope on the roof top of the tower, and it was never communicated if the system was properly reset. This is a classic case of why we verbalize and conduct physical inspections of systems time and time again. We should be checking it hands on, verbalizing as we check along the way, and have a second or third person do the same. In this case, none of that precaution happened.

**Lesson #4 – Equipment & PPE**
Regarding equipment, in some cases the equipment failed. In other cases, the equipment was not even being used, which could have had a different outcome. Some failures were the improper use of this equipment. It should be noted that only one of the cases had the rope separated (cut), which we talked about in connection with the buddy rappel. Another significant case involved a department that felt helmets were not necessarily needed on this particular training evolution. The head gear they had were ballistic helmets, and it was felt that to suddenly stop wearing these helmets would cause unnecessary neck injuries. They had ordered lighter helmets, but when they came in, they were too small. This would prove to be a fatal decision. In this particular case, the official report from the office of the medical examiner stated that the cause of death was “blunt force head trauma due to fall.” I cannot say if wearing a helmet would have saved the victim’s life, but we know through our training and experiences that having some type of head gear offers some level of protection. To make matters worse, this is the case where they were using a mechanical device that was designed for \( \frac{3}{8} \)” NFPA Static Kenrmantle Rope but decided to use 7/16” NFPA Static Kenrmantle Rope. The device did not fail; rather the smaller rope did catch the locking cam in the mechanical device only after rope slippage of a few feet. By then the victim had already descended 10’ to 20’ and gained significant speed. Though this was a tragic accident, it stresses the significance of wearing the proper PPE and following manufactures guidelines.

**Lesson #5 –Blindness**
I feel that one of the significant findings that has its own category is a phenomenon called *Inattentential blindness*, also known as *perceptual blindness*. This is one of many phenomena that have been linked to accidents and not just training fatalities. One of the case studies explained this in detail: “Inattentional blindness is the ‘looked-but-failed-to-see’ effect. It occurs when attention is focused on one aspect of a scene and overlooks an object that is prominent in the visual field and is well above sensory threshold,” (Saveland, and Pupulidy, “Rappel Accident-Human Performance Analysis”). I would equate this to looking for your car keys all over the house and then noticing them right where you looked the first time. Additional findings include *Change Blindness*, which is a failure to notice that something is different from what it was. Large changes to a visual scene are very likely to go unnoticed if they occur during saccades (eye movements) because visual analysis is suppressed during that time. This would be best equated to being shown photos and not noticing some of the changes that take place from one photo to the next.

Lastly, another phenomenon that can be tied to these case studies is *Bias*. Of course bias is a broad term, but for the purpose of this article, I am referring to a tendency to favor something/someone over another because of preconceived expectations. *E.g.* you are about to conduct a rope rescue drill and you have two firefighters;
Firefighter 1 is from a large metropolitan city that averages about two dozen high angle rescues annually. Firefighter 2 is from a small town volunteer fire department. Subconsciously, you may favor Firefighter 1 and assume that because he or she is from a big city department and goes to many “real world” incidents relating to rope rescue, you may overlook an aspect of the equipment while conducting a safety inspection. This overlook or “bias” may be in part because you assume Firefighter 1 has completed the appropriate checks and rigged the equipment properly when, in fact, he or she may not have. Conversely, you may assume that Firefighter 2 needs to be triple-checked simply because he or she is from a small town fire department. In fact, both should be checked equally to ensure their safety.

This blindness is something that can be addressed through training, diligence, and redundancy. The purpose of having redundancy is that it hopefully provides a series of levels of checks and balances to ensure the health and safety of our brothers and sisters. The best way to ensure safety is a welcomed culture. Firefighters should be encouraged to ask questions and learn. Good instructors will see this approach as a tool to teach and mentor and shouldn’t get offended because someone is asking questions or double-checking their work. Periodically inspecting equipment and communicating with people are also good avenues to pursue. It can’t be stressed enough that you need to put down a plan on paper. Everybody needs to know who is in charge, who’s the safety officer, what the plan for a real world emergency is, what we do if something breaks, etc. Interestingly, I find time and time again, when I go to a station to teach, many fire houses do not identify who is staffing what truck, or they may not assign a duty crew. This can also be problematic. If no one knows who’s going on the call, what do you think happens when the alarm comes in? You guessed it. People scatter for their gear and to get in a seat with SCBA. This can be very dangerous depending on the type of training you’re doing. This is no different from any of the above lessons on safety, communications or training. People should know roles and responsibilities so they know expectation of others. A clear line of communication can go a long way to a safer environment, better training, and proper use of equipment.

In conclusion, a review of these lessons identifies some of the contributing factors in these cases: inadequate skills training for the instructors and individuals; failure to implement a risk assessment and hazard analysis; poor supervision of individuals due to lack of qualified instructors; lack of safety; a breakdown in communications between the instructors and students; and a failure to follow safety procedures, manufacture guidelines, or good industry practices. Hopefully we can learn from these incidents. It is incumbent upon us to do our research before we train or drill. Rappelling and rope rescue are very effective skills to have. These first responders did not die in vain. Let’s do our part to learn from them so everyone goes home.

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