

The Defenestration Sensation

Presented by:

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THE DEFENESTRATION SENSATION

The presentation will highlight the many aspects of what is commonly referred to in the fire service as a “Bailout Kit”, which is a pre-rigged rope system worn by firefighters for the purpose of self rescue. In addition to self rescue, it will be shown that the kit has the capability to perform more functions than simply self rescue: it can be used to lower trapped civilians or firefighters to a safer location, as well as to remove trapped firefighters below grade. Case studies involving bailouts and an overview of more commonly used systems will be shown.

This presentation will discuss the different types of harnesses commonly used, several friction devices currently available, as well as anchor hardware and selecting a point on the fireground to which the system can be attached.

Lastly, this presentation will hopefully show that mountain rescue teams and the fire service are not always that far apart in the rope world. Despite the tendency of the fire service to generally choose rope that is too big and carabiners that are too heavy, it is not opposed to occasionally performing minimalist single rope operations, attached to anchors that are less than bombproof. We dinosaurs might just be evolving after all!

HISTORY

The modern fire service has always given at least some consideration to getting out of a burning building rapidly. The first reference I’ve been able to find on it was a rope slide with foot and

hand as friction devices in a Chicago Fire Department manual from the early 50's. The next reference available was from a Fire Engineering magazine from the mid 70's highlighting a very similar technique. It was almost more of a "circus trick" at the time and never received much more attention than those to pieces. They're still viable techniques, but the article and most who have tried it, give short thought to how to anchor the line and load it under deteriorating circumstances.



The next bailout to receive any type of attention was the hose slide; wherein a fireman would throw a charged hoseline out of the window and slide down it like a pole in the firehouse.

Problems of logic arise when you consider that conditions are so bad that you cannot get out of the building any other way and you are throwing the nozzle out of the window. Further, it is an almost a comical thought that anybody would have too much line. That is just not the reality of structural firefighting.

The next step in the evolution of the bailout kit came when firemen upgraded their utility line used to raise tools and hoses to upper floors. With the advent of smaller diameter cordage of relatively high strength and after the development of cordage that was resistant to high heat, firemen finally had the basics needed for an emergency escape kit that also usually doubled as

their utility line. Many firemen in Washington DC have never progressed beyond this point and still have their drop bag with 30-40 feet of cordage with a carabiner on the end, hanging from their breathing apparatus. Through many informal interviews, I have found that the usual answer of how they are going to deploy it is “find an anchor, do a body wrap and go.” Clearly this easier said than done, but the method has some merit.



On a personal note, this is the system that I used for several years before starting on my journey to find what I thought to be the “perfect kit” given the technology available. The technique will be discussed later, but the technique segues into the next bit of history in the development of bailout kits.

Black Sunday

On January 23, 2005, now known as Black Sunday, 6 firemen in New York were trapped on the top floor of a 5 story apartment in the Bronx. Conditions deteriorated to the point where the six

members jumped from the top floor to the ground below. Two of them, Lt. Curtis Meyran and F/F John Bellew, were killed. The other four survived, but all suffered career ending injuries. The two that were injured the least minimized their injuries because they were able to find an anchor and attach a section of rope to it and used the body wrap method to provide friction. According to one of the members, the plan was to lower to the next level down and stop there. One of the two members with the webbing stated he had practiced this technique hundreds of times with great success. One variable he said he never counted on was having wet gloves. Neither of the members were able to stop themselves at the next level and both of them essentially rappelled off the end of their line.

Two quotes in the aftermath of this incident really stand out. One is from a lieutenant who saw the actions of two of the firefighters and said that he saw Bellew climb out, hang on for a few seconds, then release, just as Curt Meyran had. "It's kind of consoling, I guess, to know that John knew what was going on and made the decision, rather than just jumping out." The second quote is from Lt. Meyran's widow who said that "a lousy piece of rope" could have saved her husband's life.

The lieutenant's quote is interesting because it shows that two experienced firefighters would rather take their chances by willingly falling from the fifth floor with than stay and be burned to death. While they were no doubt in distress, they made a conscious, presumably non-panicked, decision to jump.

Mrs. Meyran's quote shows that even people who are not firefighters can see the value in a simple piece of rope to help save their lives.

Because the Fire Department of New York (FDNY) is such a large, high profile fire department, many ideas for change in the fire service come from them, rightly or wrongly. The Black Sunday incident was no different. It brought the need for firefighter self rescue devices to the forefront of the fire service discussions for awhile. It even prompted a law in the state of New York (12NYCRR Section 800.7) that required departments to purchase escape kits for every firefighter.

What's Going On Now

In the many conversations I've had with firefighters across the country, it seems that people's feelings on bailout kits fall into one of three categories. First are the people like myself, and who feel these kits are worthwhile and can't imagine why somebody would not have one. Second are the people who like the concept, but haven't taken steps to outfit themselves because they believe their department should purchase it for them. The third and last group are those who believe, shockingly enough, that these kits are unnecessary. It is their supposition that if we put the fire out the problems of having to bail out go away. The department where I work, in Washington, DC, seems to have a very large group in the last category. Many have gone so far as to call the internal harness pants the department has bought for our Special Operations Division "quitter pants". Sometimes they are joking, but many times people are very serious and their

dislike for bailout kits. It seems that they are turned off by the word "bailout" and see no further use in any kit that can not only save themselves, but other firemen and civilians as well.

Informally, many of us are making an effort to refer to these as "rescue resource kits" and first highlighting the ways they can be used to save people other than the wearer of the kit before we begin to talk about self rescue or "bailing out".

EQUIPMENT SELECTION

There are four basic parts of a rescue resource kit:

1. Anchor
2. Cordage
3. Friction Device
4. Harness

There is a wide variety of ways to customize a system and people usually go through many variations of a system before they finally arrive at the one they are ultimately comfortable wearing. It's not really that different than any other harness setup and selection process used in traditional rope rescue.

Anchors

Carabiner

The least expensive type of end line anchor, and the one most people usually start out using, is a carabiner tied the end of the cordage. It's a familiar piece of equipment and one that most people are comfortable using already. It can be anchored in multiple ways, either remotely by wrapping it around a wall stud or other anchor, or by sliding a Halligan bar through it and anchoring at the window. If no anchors are readily available, or you have no tool to slide through the carabiner, you run into the limitation of not being able to create your own anchor at the edge. The carabiner lacks the immediate readiness of our next anchor, the hook.

Hooks

After a carabiner, the next most popular type of anchor is a hook. Currently, there are four hooks for people to choose from: Crosby, NARS, FESH, and the new CMC hook.

Crosby

The Crosby hook, being the first hook firefighters started using, is still, the benchmark to which others are compared. It remains a very popular choice for a hook because it is compact, has a perceived strength because it is made of steel, and probably most importantly for many who choose it, it was selected by the FDNY as the hook of choice for their escape systems.

There are two negatives with the Crosby hook. The first negative is a minor weight penalty compared to the aluminum hooks. While this certainly adds to its feeling of strength, it does add a bit of weight to what firefighters are already carrying around. This is particularly noticeable when used in conjunction with the harnesses which are integrated into the turnout pants.

NARS

The NARS hook developed by North American Rescue Systems took the concept one step further and added the hole in the shaft of the hook. Simply adding a hole allows a tool such as a Halligan bar to be slid in there to create an at-the-edge anchor or a bite of rope passed through there to create a fixed loop anchor around a wall stud, for instance, without having to tie a knot.

The hole in the NARS hook also allows it to be used as a friction device to lower other people to the ground or lower-level, with the other end of your escape cordage. Having this ability is quite a benefit when you consider most firefighters do not wear an escape set up and obviously civilians have no means to lower themselves to the ground. This ability to quickly rig a lowering system has just taken the escape kit from the realm of personal bailout can now be used to rescue other people with it. While this can also be done by adding a carabiner in the end of the rope next to the hook, this tends to start cluttering up the business end of the bailout kit.

FESH

The Firefighter Escape Survival Hook or FESH is less widely seen than either the Crosby or the NARS hooks. It is a piece of quarter inch stock metal, cut into a shape similar to that of a Fife hook used in aide climbing only on a larger scale. While it's throat size is larger than that of

other hooks and gives it the benefit of being able to grab under window ledges when making and at the edge anchor, it feels large and unwieldy when trying to carry it around on a daily basis in an escape kit.

CMC Escape Anchor Hook

New to the market is the CMC Rescue Escape Anchor Hook. It has the size and feel of the Crosby hook and has a hole in the shaft similar to that of the NARS hook to allow a bight to be passed. While it is brand-new to the market and I have been unable to test it as of this writing, the design of it looks sound, and it is expected to be a step forward in the anchoring department which is where the most potential for development lies.

From left to right: NARS, CMC, Crosby, FESH



Other Anchors

The only other anchor marketed directly towards the fire service is the Skedco folding window anchor. It is designed to span a corner of the window to create an at the edge anchor. Having not tested it personally, I believe the concept is sound; however, the execution could be perfected. To use this anchor, it is necessary to unclip your carabiner from it, fold the anchor into the open position, reattach your carabiner, secure your anchor, and then go. Having to unclip, unfold, and re-clip is too much to ask of a firefighter who was trying to exit a room that is rapidly becoming untenable.



Anchor Conclusions

Rapid anchor selection seems to be the key to rapid exit. Currently, some form of hook seems to be the most versatile option for quick anchoring. No hook that I've tested yet has been able to fulfill the role of being the perfect anchor for all situations. There probably is no such thing and revisions in technique and constant practicing are probably the only way to be able to positively anchor as close to 100% as practical.

The rope equipment manufacturing industry has taken great strides to increase firefighter safety. The adaptations of harnesses and friction devices to use by the fire service have been variations on a theme. The greatest room for further development is in finding a better anchor. I'm not sure

what the answer is, but I think that the vast experience of the climbing world can be applied to the fire service to keep moving in the right direction.

Cordage

In contrast to many other people who perform rope rescue, firemen are usually happiest when they are on two pieces of half-inch rope and anchored something really big with steel carabiners. This is subject to extreme change when the room you are in is turning to fire from floor to ceiling. The biggest move the fire service has made in moving towards the "right direction" is realizing the acceptable levels of strengths of modern small diameter cordage.

There is a multitude of software available, ranging from something as simple as 8mm nylon cordage all the way to 3/8" tubular Kevlar webbing. The selection of the software is usually based on the user's preference of what interfaces best with their friction device.

Escape cordage takes an absolute beating when compared to software, normally used for rope rescues.

Consider the following:

- It's carried around in a rope bag that will probably go to hundreds of calls and fires before it is never used.

- There is no chance to provide edge protection. The best edge protection and escape rope gets is, if after breaking out the window, the firefighter takes care to run is tool along the bottom edge of the window sill and clear out any glass shards that may be present.
- More likely than not, it is going to get shock loaded when the firefighter exits out of the window. Even under ideal training circumstances, it is slightly less than graceful to go headfirst out of a window with full firefighting PPE on.

Given the firefighter's predilection for compensating for a lack of knowledge with over engineered equipment and safety factors, it is impressive that we have embraced the use of such small diameter software. The only real selection criteria I have heard from the firefighters I've talked to are that it be heat resistant and that it be small so it is easy to carry, which is counterintuitive to the normal selection criteria for rope. If it works, even barely, it is better than the alternative. I have even seen 550 cord from parachutes used in an escape system, the uninformed firefighter thinking that they do not weigh 550 pounds and therefore it will hold. I've seen it hold, but that is on the ragged edge of barely.

FRICION DEVICES

There are two basic classes and friction devices for escape kits. Those that allow a hands-free exit (autolocking) and those that require some kind of control over the cordage in order to successfully negotiate an edge without falling to the ground (non-locking).

Here is an incomplete list of the friction devices available for emergency escape now. While there are many different friction devices that can be used, these represent a pretty wide cross section of what is currently being used by the fire service. See Appendix for pictures.

Autolocking

CMC Escape Artist



Petzl Exo



Sterling F4



Golfire G Zero



Non Autolocking

Munter hitch

CMC Survivor 8



Rock Exotica mini 8



CMI Firefly



CMI QXD



The selection criteria for friction device for an escape kit will usually fall in this order when somebody is initially looking for one:

1. Price
2. Size

3. Hands free
4. Ease of horizontal movement

Because most departments do not pay for escape kits, price is initially very high on the list of why someone would buy a certain friction device. This falls further down the list when people actually jump out of a window a few times and see that, while functional, a less expensive friction device may not be the best way to go.

While the non autolocking devices come in a wide range of sizes, none of the autolockers are markedly larger or smaller than any other in the autolock category. For the most part, the autolockers tend to be larger than the non lockers because they usually have some type of mechanical moving part to them. While kits need to keep their bulkiness to a minimum, most of the bulk is made up from the software rather than the hardware.

The feature that usually ends up being the deciding factor when selecting a friction device is whether they want an autolocking device or not. If given the chance to compare friction devices back to back in real world training, people tend to go for the autolockers because it is very difficult to manage a dynamic exit in full PPE, maintain anchor integrity, and try to find the free end of the rope as well.

The ability to move from a remote anchor to the window should be part of the evaluation criteria. Any device with relatively little adjustable friction is going to create issues when trying to move quickly from a remote anchor to the exit point.

HARNESSES

The topic of harnesses usually generates the most "lively" debate when talking about escape systems. Everybody has their feeling as to what is best. Harness selection can be broken down into four basic categories:

1. Belt-based system
2. External harness
3. Internal harness
4. Improvised harness

Belt Based System

A belt based system is one where the escape kit is stored in a pouch on a rated belt that is then placed on by the firefighter over their turnout coat, but before their SCBA is placed on. This allows the firefighter the leeway to determine whether the kit will be worn. For instance, it can be left in the fire truck for medical calls, car wrecks, etc..., when it is not warranted to carry around the weight and bulk of the kit, yet still be available to be quickly donned if it is a fire call.

The most common argument against this type of setup is that it is not as comfortable as a seat type harness. This is true; however, emergency escapes are so few and far between and occur for such a short duration, that comfort should not be a very high selection criterion. I have found that

the ability to don my gear quickly is more important to me than the 30 seconds of comfort I will be afforded, should I ever have to use my escape kit.



External Harness

An external harness is a seat harness that is installed over top of the turnout pants. The escape kit is usually stored in one of the pockets of the turnout pants. The inherent hazard to be aware of with these pants is that by adding webbing to the outside of firefighter PPE, and additional potential for entanglement exists. It is a simple way to add a seat type harness, if that is the preference, to existing gear. The only modification most people do to the PPE is to add tabs to keep the leg loops all the harness from drooping down too low.



Internal Harnesses

Internal harnesses are seat type harnesses that are installed in the PPE between the liner in the shell. It is possible to put a seat harness in turnout pants not designed for an internal harness, but the fit is usually less than ideal and the *idea* of installing a harness in pants not designed for it is often better than the reality of it.

There are at least two PPE manufacturers that I know of, who are designing their gear around an internal harness. The mechanics necessary to don the pants and the fitment of them are designed around the harness. The harness is not an afterthought.

One area of consideration that I have seen no mention of is the compression of the thermal barrier in the PPE and whether or not this will create burn injuries in those areas where the leg loops compress the liner.



Improvised Harness

The last type of harness commonly seen on firefighters who have an escape system is the improvised harness. Some people will tie a Swiss seat with 1 inch webbing and put it on the

interior of their gear between the liner and shell of their turnout pants. Others have a sufficient length of webbing to tie a Swiss seat around themselves when the need arises. The obvious flaw in this is that they have to take the extra time to secure their webbing, hope they tie the appropriate harness, and then hook up their system and locate an anchor.

It is better than nothing, and people realize rather quickly after training with it enough, that they need to upgrade to a manufactured harness or belt that does not require tying.



EXIT TECHNIQUES

Just as in rope rescue, the foundation of any good system is the anchor. The best option for anchoring for firefighter escape is to anchor remotely from the edge and attach to a substantial object that will not allow the hook to slide off while the firefighter moves towards the exit window. Anchoring in this manner will allow leeway if the cordage goes slack as the firefighter is moving to the window. In other words, the hook will not come off of the anchor just because there's no tension on it.

This can be accomplished by kicking a hole in the drywall and wrapping the hook around the wall stud or two. Or a hook can be tossed over an open door and the door slammed shut. This creates a type of chock stone anchor. If you are able to keep the force in the direction of keeping the door closed when you load a look, you may be able to place as much as 1000 pounds of force on that anchor without failure. With either of these methods you can see that the hook will not come off of the anchor if the cordage goes slack while moving towards the edge. This is about as bombproof as anchors get in a residential dwelling.



Moving on to more marginal anchors and the raison d'être for having a hook, is anchoring at the edge. If building construction or time do not permit finding a substantial anchor away from the window, the last-ditch method of anchoring is to place your hook in the lower corner of the window and rollout. If there is a substantial windowsill, and you are confident in its ability to hold, you can place your hook directly on that and exit. Otherwise the hook should be placed in the corner of the window so that if your hook tries to rotate out of position when you load it you

have 270° of wall and windowsill to act as an anchor. A variation on this, and a slightly more secure anchor, is to place Halligan bar in the corner of the window and anchor a hook to that.



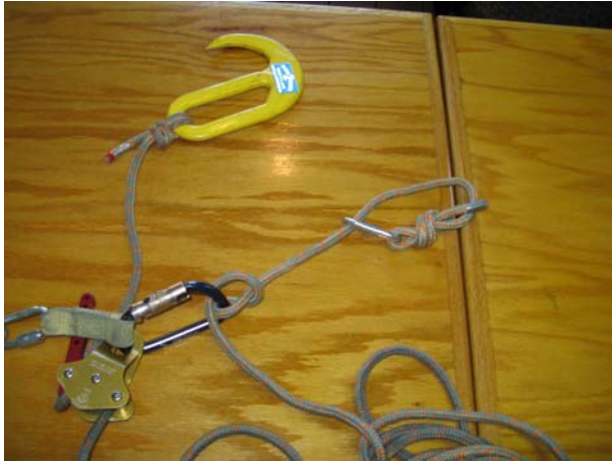
The actual technique for getting out of the window is to place one hand low on the inside of the window with the hook in your hand, place your other hand on the outside of the building, and do a headfirst rollout, while making sure your hook stays securely in position in the corner of the window. This low-profile technique allows firefighters to stay out of the upper portion of the window where the majority of the heat and fire will be exiting. The added benefit of this technique is that if you are unable to secure anchor or the anchor comes free during your rollout, you can hook your last leg out of the window onto the window sill and hang by an arm and a leg

until somebody is able to throw ladder to you onto you're unable to hold on anymore.



The fire service is also attempting to become more familiar with counterweight anchors. By using the free end of the cordage wrapped around a victim or a firefighter without a kit, you can use yourself as an anchor and lower them down to a lower level. The friction can be provided either by using the hole in the hook as a figure 8, or by using a carabiner in your system from Munter hitch. By using this method, you will have your rope deployed down the side of the building and will still have your hook with you, ready to be anchored when it is your turn to go. If the victim is not able to reach the ground or a lower level, there are techniques to allow two people to hang on one rope simultaneously until the ladder can be gotten for them.

It is also possible to wrap your hook around somebody and lower them with your friction device. This will only work if they can reach the ground and undo the hook when they get there. Otherwise, they will be left hanging in midair, while you are left in the room on fire as their anchor.



CONCLUSION

The bailout kit will continue to be hot topic in the fire service for the foreseeable future. The merits of it will be debated ad nauseum, as firefighters and rope people are wont to do with their favorite subjects. Personal preference will always play a role, but hopefully the usefulness of this tool can be seen and the spirited debates around it will continue to drive technology forward and help make firemen a little safer when entering a burning building.

As for the bailout being for quitters... With a little creativity and imagination, these kits can be used to create 3:1 haul systems with a progress capture (when using an autolocker), to effect below grade rescues, to lower an unconscious firefighter off of a roof, etc... you're limited only by your imagination and your ability to train realistically, hopefully in an acquired structure, where real world problems can present themselves.

Stay Safe

NOTES

