Elevators, Air Supply, and FARS

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"E-11 to Command. We need air bottles to the floor 27. Crews are running low! We have multiple rescues in progress."

This could happen to any crew out there. Given the intensive workload required and challenges presented by getting air to upper floors, needing additional air resupply should be expected. Not to worry, we can simply load an elevator with bottles and send them up. They'll be there quickly, right?

Wrong.

When compared to using the stairwell, elevators may be the quickest way to send the crew air, but they can also be the most dangerous and unreliable. It's easy to believe that running elevator calls or using them as a tool during a fire is a simple, risk-free operation. Unless you understand the mechanics behind these machines and grasp the safety features, however, you would be gravely mistaken. In addition, relying on elevators and stairwells as the primary means of air replenishment presents serious strategic and tactical problems.

The following must be seriously considered when deciding the value of FARS against the reality of elevators and stairwells for air resupply:

1. **Elevators require precise operations and routinely malfunction at fires.**
2. **Elevators must still be loaded manually and are used for other jobs**
3. **Elevators only take bottles to 2 floors below the fire and are useless for air resupply on floors above the fire.**

Elevators require precise operations and routinely malfunction at fires.

One of the biggest problems with using elevators is complacency. There is a tendency to think the elevator will operate and perform exactly as we expect it to, without complications. The reality is that elevators are complex machines that have the real possibility of malfunctioning. After all, it is a metal box controlled by a computer in a building that is now on fire.

Upon arrival at a fire, there are some basic things the fire department must do to make the elevator safer. Firefighters MUST place the elevators in ”firefighter service.” You must fully understand how this elevator operates in phase 1 and phase 2 and be aware of the dangers and nuances that may occur.

First, you must bring your key to access the elevator and switch it to firefighter service, either from the rig or in a key box. Once the key is obtained, the phase one key panel must be located. The elevator is then put into phase 1 by turning the key to “on.” There is a chance that the elevator will not respond. There may be a computer issue, the technician may have the elevator on “inspection” mode, or some other situation may occur. Just be aware that the elevator arriving in the lobby is NOT guaranteed!

Assuming the elevator arrives and you enter the elevator to place it in phase 2, the next action should be to locate the illuminated fire hat on the panel. If this fire hat is flashing, it means that a smoke detector in the elevator machine room or hoist way has gone off. If the building contains a sprinkler system, there will be a heat detector within 24 inches of the sprinkler. This heat detector is set to go off at a lower temperature than the sprinkler to prevent water from falling on an actively powered elevator. Elevator malfunctions have occurred in this manner, causing the system to fail in responding to in-car requests. To prevent this, the heat detector was installed. If the helmet is flashing, you are in danger of a “shunt trip” occurring. This will disengage ALL power to the elevator, and it will not respond to any in-car requests. You are essentially stuck somewhere in the hoist way.

Remember, now that the elevator is in phase 2 it will only do what you tell it to do. To close the doors, you must push AND hold the button until the doors close completely. If you do not, the doors will open. Once you arrive at your destination, you will need to push AND hold the door open button. This is critical to remember. If you do not push AND hold the button to fully open, the doors will automatically revert to the closed position. And unless someone is inside the elevator car when the doors close, you will be locked out and that elevator car will be rendered useless. This situation could be deadly for crews waiting for the air bottles that are now trapped inside the elevator.

The examples of how elevators can stall, or malfunction, are numerous and occur frequently during “normal use and operation.” One such incident occurred at the department of one of the authors of this article. While training, the elevator intermittently stalled and there was no obvious reason why it kept happening. After lengthy investigation, it was found that when certain windows were open in the tower it caused a door on an upper floor to not fully close and seal. Something as simple as one of the doors not fully closing caused the rest of this elevator to stop moving. The door had to be located and fully closed for operation to continue. Easy to do in a training tower but likely impossible in a high-rise fire. This could also occur if someone intentionally blocked open a door

during an “arson” fire. Entire books could be written on the numerous ways that elevators experienced operational issues.

Beefing up the elevators and providing additional safety measures was the goal of Fire Service Access Elevators (FSAEs). The requirement to provide FSAEs can be found in the International Building Code (IBC) 2015. These are elevators required in buildings with an occupied floor greater than 120 feet above the lowest level of fire department vehicle access.

FSAEs are not immune to mechanical issues that are seen in regular elevators. They are simply elevators that do not have sprinklers in the machine room or shafts which could cause a shunt trip. Sprinklers will not be installed in the FSAE’s control room or hoist way, but will have a smoke detector. In addition, the elevator must be protected from water entering the shaft and utilizes drains, scuppers, sloping floors, dams around hoist ways, gasket on doors/barriers and gutters. All good measures to mitigate the introduction of water, but all having the possibility of failure.

Even with the above precautions, the elevator is not immune to electrical/computer issues. It is still a computer controlling a metal box in a building that is on fire. Human error is still a big factor and, once these mechanisms fail, it is typically for the duration of the incident. Crews fighting the fire, and needing critical air resupply, will be forced to abandon the attack when no air arrives.

Relying on elevators for air resupply, even in FSAEs, is an unnecessary risk when FARS is installed.

Elevators must still be loaded manually and are used for other tasks.

The idea that using elevators to move bottles is easy and fast is simply wrong. This misperception is largely due to a lack of experience at real fires in large buildings. It is difficult to arrange realistic training in large buildings and so erroneous ideas have developed.

In reality, it takes a great deal of time and effort to manually transport bottles into the lobby for loading of the elevator. Firefighters must still get bottles off the rig and carry them to elevators, which sounds easy until you try it. Those bottles are being carried in full gear, SCBA on your back and needing to bring numerous other essential pieces of equipment. Bottles are not moved as the sole focus of the incident but are one part of the needed equipment that must be addressed.

How good would it be to have that part of the equation resolved with an air standpipe? The initial bottle you carry up is the one on your back and that leaves room for all the other equipment that will be necessary to fight the fire. As later crews arrive and an “Air Group” can be established, additional bottles can be shuttled in a coordinated way to the staging floor.

In addition to the work getting bottles to the elevator, there is only so much room for equipment during each trip up, as well as weight restrictions. Once arriving at the staging floor, the equipment must all be removed so the elevator can return to the lobby for additional tasks. Once again, this does not happen by itself and must be accomplished by firefighters who will not be engaged in other aspects of the attack. It’s important to keep this in mind as it does represent a time factor that should inform tactics.

One last problem with carrying bottles is the challenge in keeping them protected. They can be carried with straps, bags or by hand, but are unwieldy and difficult to manage. There is always danger of damaging the valve assembly or rupturing the cylinder. This is particularly true when trying to carry other equipment, navigating debris, climbing stairs, or being in tight areas. Piling bottles into an elevator car with other equipment, especially in the rapid manner needed during fires, can easily cause damage. There is a big difference in an ax or piece of hose being dropped on a hard floor verses an air bottle. The possibilities for valve assemblies to bust loose are a reality, and having an air cylinder rocketing would certainly make things interesting.

The massive amount time, effort and energy needed to move air bottles on the front end of fast moving, difficult fire is unnecessary when FARS is present.

Elevators only take bottles to 2 floors below the fire and are useless for air resupply on upper floors above the fire including search.

The single biggest misconception about the efficacy of moving bottles via elevators or the stairs is that once they arrive at the staging area, all is good. That may be fine for other types of equipment but not for air bottles. Air needs to be replenished and having it two floors below the fire, in a building that can extend many, many floors above that, is a challenge for firefighters. Unlike hose or other types of equipment that can simply be taken over by new arriving crews, once a bottle is used, it is empty. And that empty bottle is now dead weight on a firefighter who still needs air. Depending on where the firefighter runs low on air, a resupply may be 10, 15 or 20+ floors below their location.

Consider the following scenario, which is very realistic and likely to occur in most jurisdictions with large buildings: The fire department arrives at reported high rise fire and gets an initial report of fire on floor 12 of a 20-story residential high rise. You can substitute fire on any floor you like and make this building however many floors you are likely to encounter. The point should not be lost, no matter how you configure this fire.

Using the first example, firefighters will establish lobby control, capture the elevators, and designate the stairwells for fireground operations. If the elevators are working, they may be used to shuttle bottles that need to be carried from the rigs along with all the other equipment needed. Those bottles, if they make it, will be deposited no higher than floor 8 or 9. Given this is a residential building, firefighters can expect a significant life hazard on the fire floor and all floors above due to both fire and smoke movement. Most departments are prioritizing a “protect in place” strategy due to the extreme difficulty of moving so many people through large buildings and smoke-filled hallways and stairwells. The smoke problem, however, is going to be present depending on how the building is vented, the configuration of the HVAC system and environmental factors such as Stack Effect.

As firefighters proceed above the staging floor, they have a full 11 or 12 floors of possible search and rescue to accomplish, with the real possibility that many of those residents may be in compromised positions. Most of that work, including getting up the stairs, is going to have to be done on air as smoke and gases will be traveling upwards in the building. It may also be true, with Reverse Stack Effect and smoke cooled from sprinklers, that smoke may travel downward as well, further complicating things. Air supply is going to be depleted rapidly in these scenarios and, with no FARS in place, the air is down on the 8th floor in staging (if at all).

If FARS are in place, air is available on the upper floors and search/rescue operations can continue without interruption. If areas of refuge are being used, firefighters can gather residents to positions of safety until the fire can be stopped. Even after the fire is extinguished, the smoke problem will persist. Without FARS, the rapid depletion of air with limited or no resupply causes a few very predictable things to occur:

1. Firefighters must exceed safe operations and continue without their masks on and hope the smoke/gasses do not compromise them physically.
2. Firefighters must interrupt search operations to find air resupply from additional bottles they have brought with them from staging. These bottles are likely to be dropped along the way due to their weight and difficulty in carrying them, so they must be found where they were left or staged. Firefighters must be off air as they will have to disconnect from their SCBA air supply to change bottles.
3. Firefighters must interrupt search/rescue operations to travel back to the staging floor to get air resupply. The significance of the is delay cannot be overstated. Traveling multiple floors down past the fire floor to get to staging, change bottles, and then travel back up the stairs.

The above operations were acceptable when no other options were available to address the upper floors. The development of FARS has made the unacceptable options listed above unnecessary. With an abundant supply of air available in the "air standpipe," firefighters can resupply at the level of their operations with minimal interruption and much less exertion.

Ensuring that occupants are not in compromised positions due to rising and accumulating smoke is critical to a successful outcome in these fires. The deadly nature of the modern smoke environment, due to the abundance of plastics and other synthetics in the smoke, makes rapid search/rescue crucial. That cannot happen without ready air re-supply at all levels. FARS is the only reliable option to ensure this is possible.

Elevators serve a purpose and can be used as part of the overall strategy to attack fires in large structures. What cannot be effectively argued is that they should be used for the critical job of air resupply. Firefighters would never accept the idea that water should be carried in buckets in elevators to upper floors. It is fully understood that water must travel in a standpipe or through supply hose to upper floors, so it is readily available when needed.

Air is exactly the same type of resource. It must be readily supplied and available in the amounts needed or firefighters must retreat or be exposed to deadly smoke.

Only FARS can accomplish safe, ready, immediate, and endless air resupply. They should be required in all large structures to ensure firefighters can attack the fire and occupants have the best chance of surviving the fire.

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