

For Firefighting Crews, Size Matters

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A recent report could help increase a fire engine crew to a minimum of four professional firefighters per vehicle. Credit: amherstnh.gov/fire

Feeling the pinch of the economic downturn, many fire stations are cutting down the number of firefighters riding each truck.

Fifty years ago, trucks carried six, seven, or eight men apiece. Today, three-person crews are not uncommon, and some departments, like Hernando County Fire Rescue in Florida, have trimmed their crews down to two people per vehicle.

"That's our normal staffing on half our engines," said Assistant Chief Frank DeFrancesco. "I have to send more units to each fire, causing delays and longer response times when a secondary fire comes in."

A scientific report released on April 28 could help fire chiefs push staffing back up to a minimum of four professional firefighters per vehicle. The experiments, conducted by the National Institute of Standards and Technology, showed that, for crews facing a single-family home on fire, size matters.

"For years, many fire departments have been fighting for safe and adequate staffing," said Scott Graham, an assistant chief at Montgomery County Fire and Rescue who worked on the study. "There has just never been any science behind the view that four or five can do it much easier, much more efficient, and much safer than two or three."

Dancing Fire Companies

"Fighting a fire is kind of like a ballet," said James Winkley, a retired New York firefighter. "Things have to happen simultaneously."

After a call comes in, a fire department sends several vehicles to the scene. In the first few minutes, an engine company carrying hoses puts water on the fire while a ladder company prepares ladders for entry and pokes holes to guide the flames and smoke. As other crews arrive, often from more distant stations, search and rescue procedures are initiated. The assembled group of firefighters has only minutes to get the situation under control.

"In my experience, it's virtually impossible to do a proper [fire suppression](#) without at least four people on the first arriving vehicle," said Winkley.

To scientifically test the effect of crew size, NIST sent teams of Maryland and Virginia firefighters to the Maryland Fire and Rescue Institute in College Park. They faced a two-story single-family home built and set on fire sixty times: sometimes with as few as two people per

vehicle, sometimes with as many as five.

The crews were timed on 22 tasks, from preparing the hoses to checking the health of the firefighters after each blaze was extinguished.

"This is the meat and potatoes of fire response: the residential scenario," said Jason Averill, a fire protection engineer who worked on the NIST study. He said that other studies have considered higher-risk situations like densely-packed apartment building, which require larger crew sizes.

Fighting Fire With Four

Crews staffed with two people per vehicle were unable to reach a hypothetical adult trapped on the top floor before that person would have passed out from the smoke.

Adding a third firefighter on each vehicle provided the manpower to accomplish this, but only if all the crews arrived soon after the first vehicle.

A fourth person gave the first firefighters to arrive on the scene greater flexibility to operate if their backup was stuck in traffic and took longer to arrive. Four-person crews were much faster at some of their tasks -- raising ladders to windows in 25 percent less time and putting water on the fire half a minute faster.

Four-person crews could also finish the job and get back to their stations to be ready for another call in 25 percent less time. Adding a fifth member had little effect on this time.

Working in a smaller crew was harder on the firefighters' health. Their maximum heart rates were higher and stayed higher after each drill when they served in two or three-person crews. Heart attacks are the leading

cause of on-duty death in the profession.

The firefighting community will likely use this research to appeal to the local council members who decide their budgets. It supports previous studies from local fire departments in Dallas, Seattle, and Austin that also found benefits in having larger crews.

"The only reason that fire companies don't have four men is money," said Lori-Moore-Merrell, spokesperson for the International Association of Firefighters. "We believe that four firefighters is the minimum, the floor. Risk managers in cities need to think about the risks of going under that floor."

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