Understanding the latest UL Research

Many firefighters would be aware that Underwriters Laboratories (UL) and FDNY have completed some excellent research in exterior hose stream and controlling flow paths (http://ulfirefightersafety.com/). I would suggest that anyone that has been following this research read Ed Hartin's blog entry (http://cfbt-us.com/wordpress/). The bottom line is, 'it depends'. As usual, the risk is to see this tactical application of water and door control as the new 'panacea' and something that should be done all the time regardless of other factors.

There is no argument that the science is sound. Controlling the 'flow path' and therefore limiting the fire's access to fresh oxygen will limit the heat release rate (HRR) and this is a good thing. In fact our own training programs based on over 30 years of fire behaviour based European firefighting has always suggested control of the 'air track' (the 'A' in B-SAHF) and the use of anti-ventilation by controlling doorways etc (see Fire 1 & 2 programs and particular 'door entry' techniques). In that regard what is 'new' to the North American fire services has been standard practice to most Australian and European fire services for many years. But to previously 'aggressive ventilators' in the US, this is very new and different and in many instances the exact opposite to many years of tradition.

However, the reluctance to attack a fire with external hose streams especially when crews are also involved in interior operations, is something all fire services around the globe have shared. If you did so, you were considered a poor firefighter. The fear (supported by many anecdotal experiences) was that conditions would become worst for victims and firefighters as fire is 'pushed' from the room being hit by external hose stream and into adjoining compartments.

Examination of whether this was indeed true followed on from the research into 'wind driven' fires that was completed in 2009 (summarised in our High Rise program). During the wind driven research it was found that one way in which to control HRR from the room of origin into adjoining areas (hallways etc), was to introduce water from the exterior. In cases where the fire compartment was too high, special nozzles were devised that could be used from the floor below. The effectiveness of an exterior attack under these conditions was seen during the Bankstown fire where two female occupants tragically died in 2012. There is no doubt that the exterior attack (line of 70mm from the street) helped gain control of interior conditions.

The next stage in the research has now looked at the effects of exterior streams under 'normal' conditions (i.e. not wind driven). The research conducted with the FDNY utilising real structures (brick and tile apartments) and full residential fuel loads, confirmed that the application of water from the exterior did not 'push fire' into adjoining compartments. Their definition / measurement of 'pushing fire' was to see if there was a rise in temperature in the adjoining compartments once the water was applied. The tests (admittedly under controlled conditions) was conclusive. In all iterations, temperature dropped in adjoining compartments.

Does this mean that the experiences of a hundred years of firefighting was all a figment of our imaginations? Of course not. But we need to put in all in context.

There is no doubt that our fires have changes significantly over the last 30 years due to fundamental changes in building construction and the composition of the contents.

This has led to fires that move from a ‘fuel controlled’ state to a ‘ventilation controlled state’ in a much shorter time and in most cases well before we arrive (see Fire 1 program - ‘burning regimes’).

If we look at the traditional ‘fuel controlled’ fire we can see that even in the ‘70’s, time to flashover was on average 17 minutes. In most cases crews would arrive with the fire still fuel controlled. The application of fresh air would not cause significant increase in HRR as the fire already had sufficient oxygen given the composition of the burning combustibles. With limited SCBA use it was therefore beneficial to aggressively ventilate. This removed smoke and raised the neutral plane improving visibility (and breathability for firefighters and victims) without making the fire worse. And any streams from outside actually made these conditions worse by moving smoke and steam around the structure and upsetting the thermal balance. Imagine also the limits of the PPE that was worn back then. How often did we get ‘steamed’ in the ‘lion tamer’s suit’?!

If fires had been fought this way for over a hundred years it is not surprising that these tactics and techniques are heavily ingrained in firefighter culture and form the basis of most fire training manuals, even to this day (at least in the US). Aggressive ventialtion is good and water from outside is bad.

But everything has changed in the last 30 years. Increasingly the contents have led to a rapid move to a ‘ventilation controlled’ state. This means that the fire’s access to fresh air (oxygen) now becomes the number one element in how quickly that fire increases in size and intensity (HRR).

For example, if we arrive to a house fire with no windows open (or broken) to the room of origin and even though it has ‘flashed over’, temperatures will be below 800°C. But once the window fails, temperatures will climb over 1000°C. Hence no firefighter likes to hear the sound of breaking glass as it normally is followed by an increase in fire intensity. Don’t be fooled by the sight of a ‘venting fire’. It is not a ‘cooler’ fire. HRR is higher and whatever heat is escaping out of the window is also escaping into the interior and the adjoining rooms.

Therefore our ability to control the flow of air to the fire will help limit HRR. Similarly our ability to apply water to the burning combustibles as soon as possible will also dictate how successful we are in our endeavours to save lives and property. As soon as possible may mean that a well directed hose stream from the exterior can help limit the HRR from the room of origin therefore supporting firefighters conducting interior operations.

Remember the reason for ‘gas cooling’. Firefighters need to ensure that the fire gases enroute to the fire are cooled so they cannot reach their auto ignition temperature. Any attack on the fire that is heating these gases is therefore also beneficial. Any steam produced by the exterior attack (and this is not ‘pushing fire’) is no longer such a concern given the moisture barrier in our modern PPE.

UL and FDNY also believe that by using a jet against the ceiling of the room on fire it will limit steam production by allowing it to escape to the low pressure area outside, whereas a fog cone would ‘block’ off the window. Certainly if the fire is on a floor above street level a straight jet is the only option for firefighters to get the water ‘in there’. I would suggest however that if the fire is on the same level as the firefighter

(street level) and the room is fully involved, an indirect attack should be used to not only ‘knock down’ the fire but extinguish it (see hose stream techniques Fire 1 program).

The application of water from outside should be a tactical consideration to be assessed on arrival at any fire. But as mentioned earlier it must be used in context and like all fires ‘it depends’. If water can be utilised quickly from the exterior in support of interior crews whilst they advance on the fire or gain entry, in most cases it will be of benefit as temperatures will drop in adjoining compartments. But the time taken to do this should not impede the speed at which we commence or continue with our interior attack (if an offensive strategy has been chosen). The advantages of advancing over the ‘unburned’ ground as quickly as possible are still significant and have not changed. By doing this quickly and safely we can:

1. Put firefighters in are areas where victims who have escaped the fire are more likely to be therefore increasing our likelihood of finding them quickly.
2. Place a hoseline between the fire, saveable property and areas of refuge and establish a ‘cut off’ point.
3. Placing firefighters in the best position to put water on the burning combustibles that may be shielded from an exterior attack.

All of the above are important reasons why we normally choose offensive interior operations wherever possible and this should not be compromised by time lost getting to work with exterior lines instead. The key is to support interior operations by closely co-ordinating both attacks and controlling the flow of fresh air to the fire.

What the research does show us is that well executed and timely exterior attacks do not worsen conditions for firefighters or push fire into uninvolved areas. Further research is planned to assess the effects of steam and smoke on victims that may be in those adjoining rooms. This will add to knowledge in this area.

Stay tuned!

Fire Training Team