

# Effective Exterior Streams

IFIW 2017  
Hong Kong

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Chief Ed Hartin  
MS, EFO, FiFireE, CFO



Learn

# Tehran Fire Brigade

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Our brotherhood and sisterhood  
knows no boundaries

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# Whidbey Island

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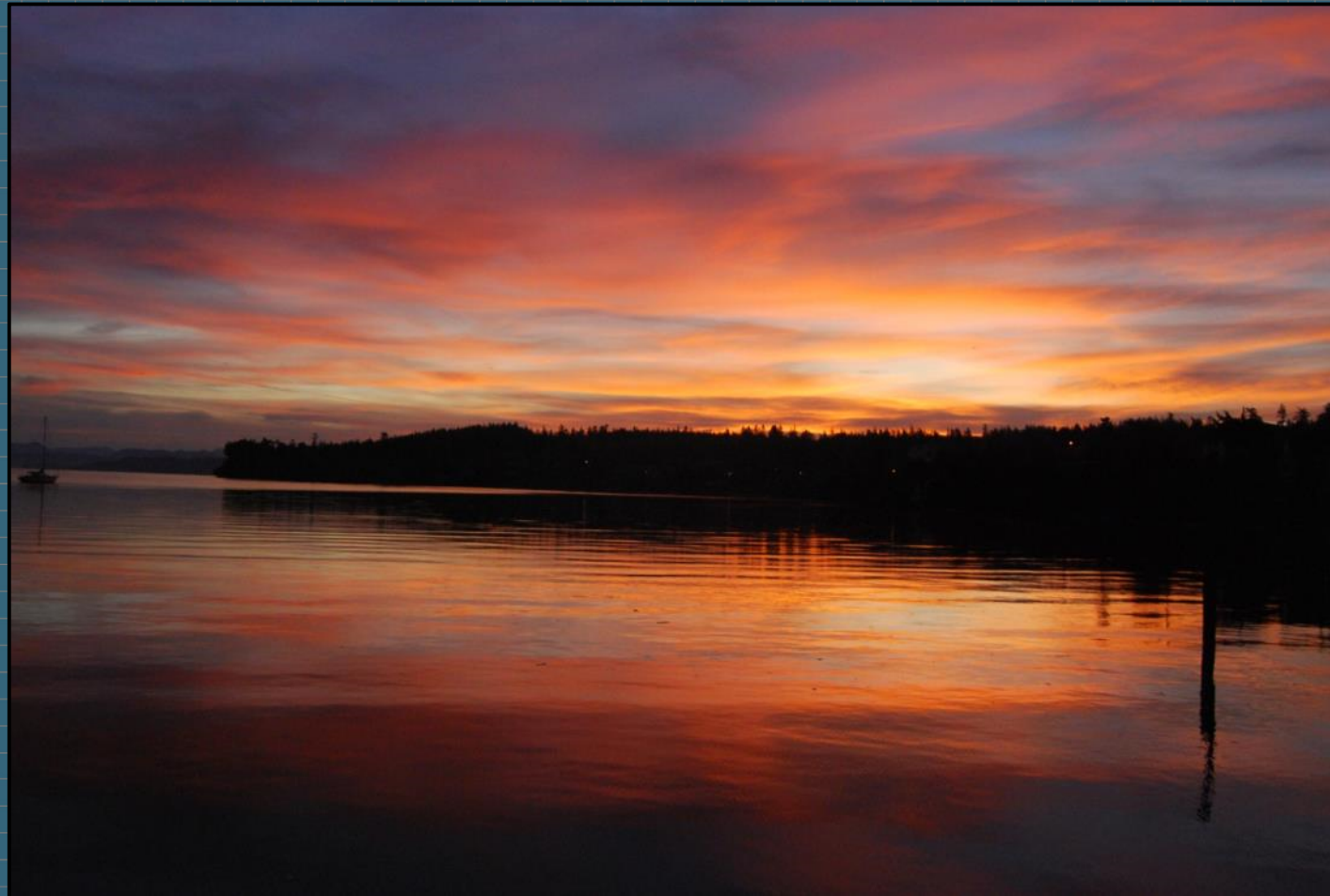
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- United States
- Canada
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A number of research outcomes  
**challenge traditional perspectives**  
and fireground tactics...



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# Myths & Misconceptions

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- Exterior streams will push fire to uninvolved areas of the building.
- Exterior application will worsen interior conditions for both occupants and firefighters.
- Only cowards use exterior streams...

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- Explain a framework for offensive and defensive fireground strategies.
- Identify the implications of current fire dynamics research on water application.
- Explain the difference between direct attack and indirect attack.

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- Recognize impacts of exterior water application on air track.
- Identify conditions under which exterior application of water may be effective.
- Develop sound doctrine for use of exterior streams for offensive and defensive fire attack.

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# Research With the Fire Service

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- Wind Driven Fires
- Engineered Lumber
- Horizontal Ventilation
- Vertical Ventilation
- O'Hare Airport
- Governors Island, NY
- Spartanburg, SC
- Attic Fires
- *PPV*
- Fire Streams (*in progress*)
- Training Fires (*in progress*)



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# An Evolutionary Process

Each research project focuses on one or two significant and testable questions.

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# What the Research Doesn't Say

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- Exterior attack is always the best choice.
- VEIS is the best method for search.
- Ventilation should not be performed.
- Horizontal (or vertical) ventilation is bad.
- Solid (or straight) streams are more effective than a fog pattern.
- Less than \_\_\_\_\_ gpm (or lpm) is dangerous

*While false, each of these ideas has been presented as being supported by the findings of the UL/NIST ventilation research projects in the press or on social media.*

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# Confirmation Bias

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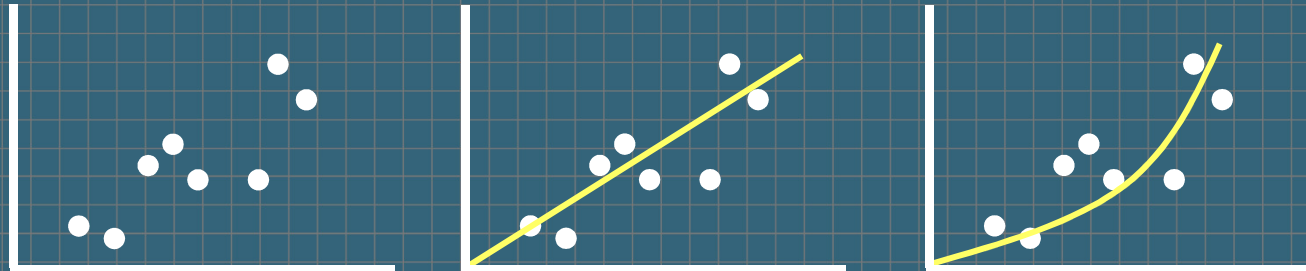
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The tendency to search for, or interpret, information in a way that confirms one's preconceptions..



*Think about what you know and how you know it, remove your ego, ask better questions, and seek disagreement!*

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# Limitations of Observation

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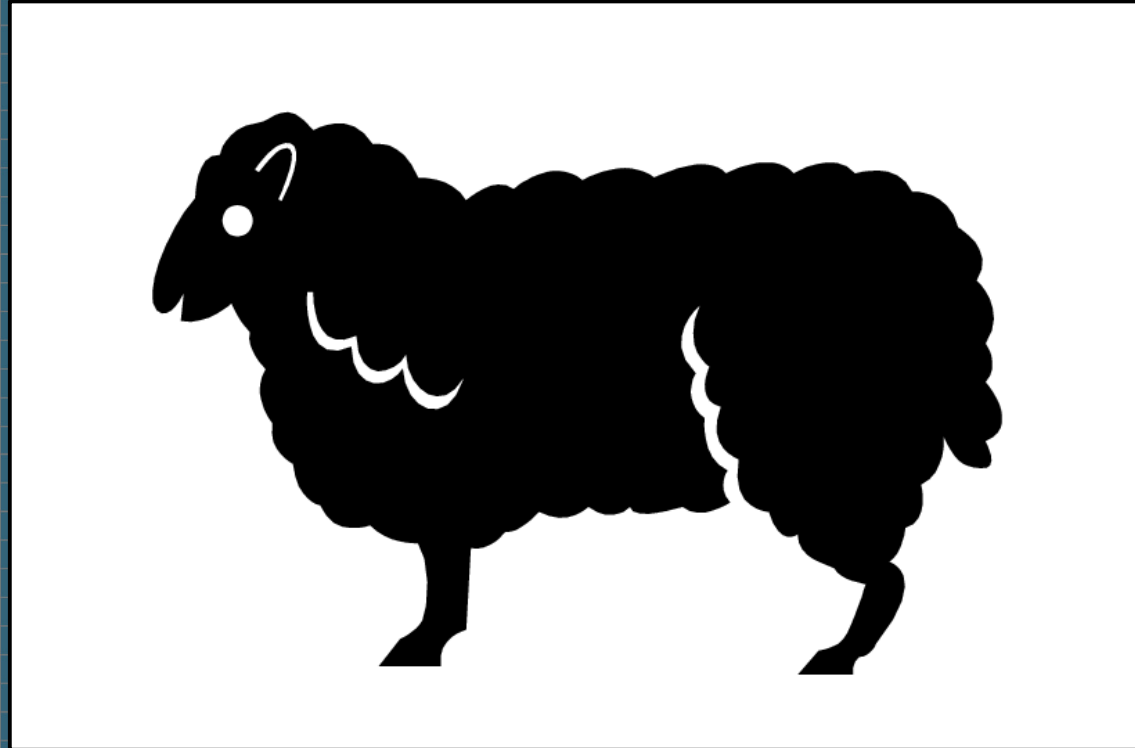
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*A scientist, an engineer,  
and a firefighter...*

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# Tactical Implications

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“Before you read this section [tactical implications] it is very important to understand this information and these considerations as they pertain to the types of structures used in these experiments.”

*These tactical considerations are not meant to be rules but to be concepts to think about, and if they pertain to you by all means adapt them to your operations.*

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# Fire Control

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- Quick Water, Regardless from Where <sub>(V)</sub>
- You Can't Push Fire with Water <sub>(H, V)</sub>
- Direct Attack is Important <sub>(V)</sub>



[vimeo.com/71471869](https://vimeo.com/71471869)

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# Context is Critical

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- Engine Company Staffing
- First Alarm Staffing
- Fire Conditions & Location
- The Building
- Accessibility
- Time
  - *Fire Development*
  - *Tactical Operations*

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# Now What?

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What **can you do** to apply these concepts on the fireground?



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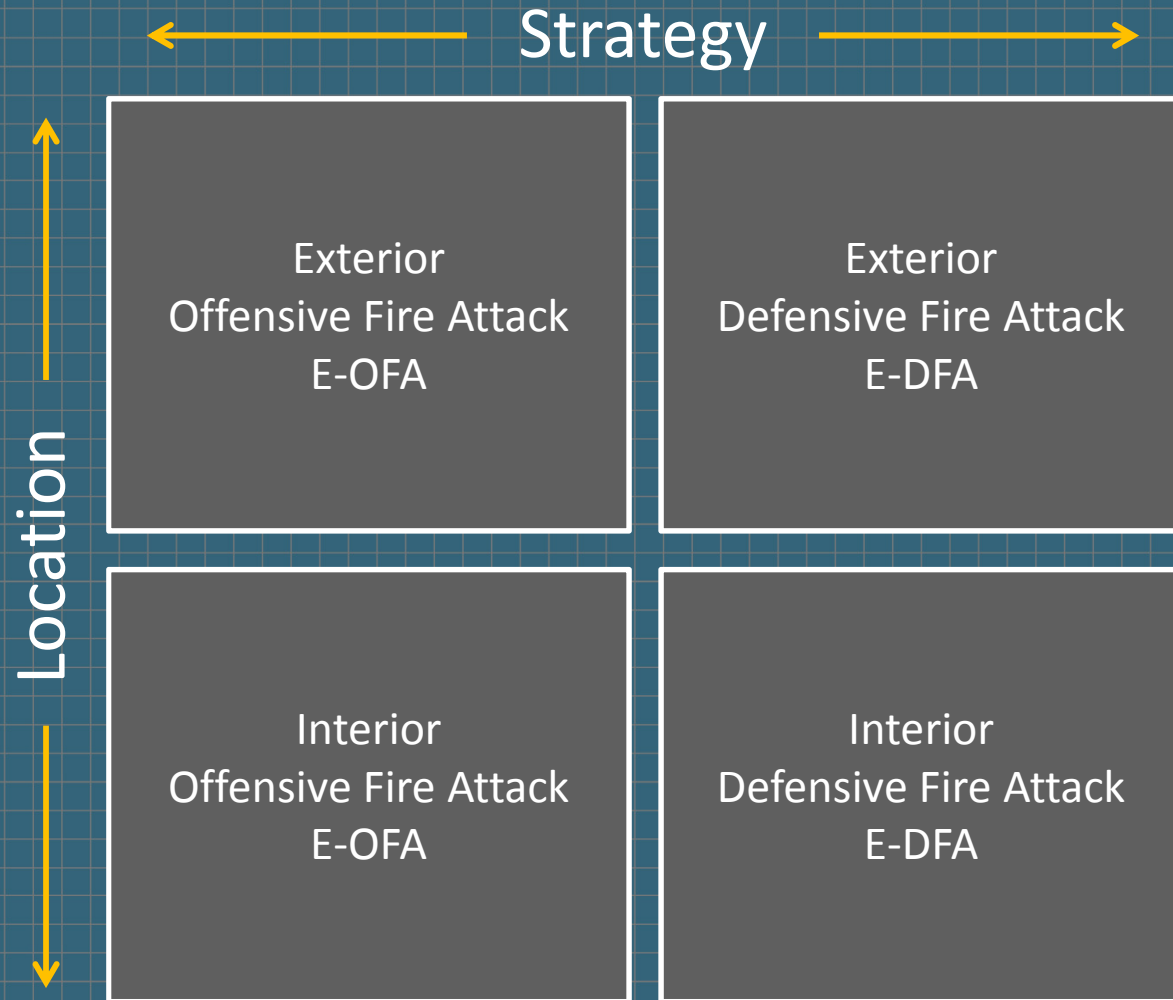
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# Simple Model

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← Strategy →

Exterior  
(Inside Collapse Zone)  
Offensive Fire Attack

Exterior  
(Outside Collapse Zone)  
Defensive Fire Attack

Interior  
(Inside the Building)  
Offensive Fire Attack

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# Offensive Tactical Options

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## Option 1

- Exterior
- Position close to the fire
- Direct or indirect attack

## Option 2

- Interior
- Door entry
- Control the environment
- Direct or indirect attack

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# Direct and Indirect Fire Attack

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- Direct Attack

*Application of water to cool the surfaces of burning or pyrolyzing fuel.*

- Indirect Attack

*Application of water to hot surfaces to create a large volume of steam, cooling surfaces & gases, and to displace oxygen.*

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# Ventilation Under Fire Conditions

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Building ventilation under fire conditions is influenced by multiple factors:

- Building openings and potential openings
- Differences in density
  - As hot gases expand, density (mass/unit volume) decreases*
- Differences in pressure
  - *Thermal effects*
  - *External influences (wind)*



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# Flow Path(s)

The volume between inlet and outlet openings, the path of travel for air (in) and hot smoke and air (out)

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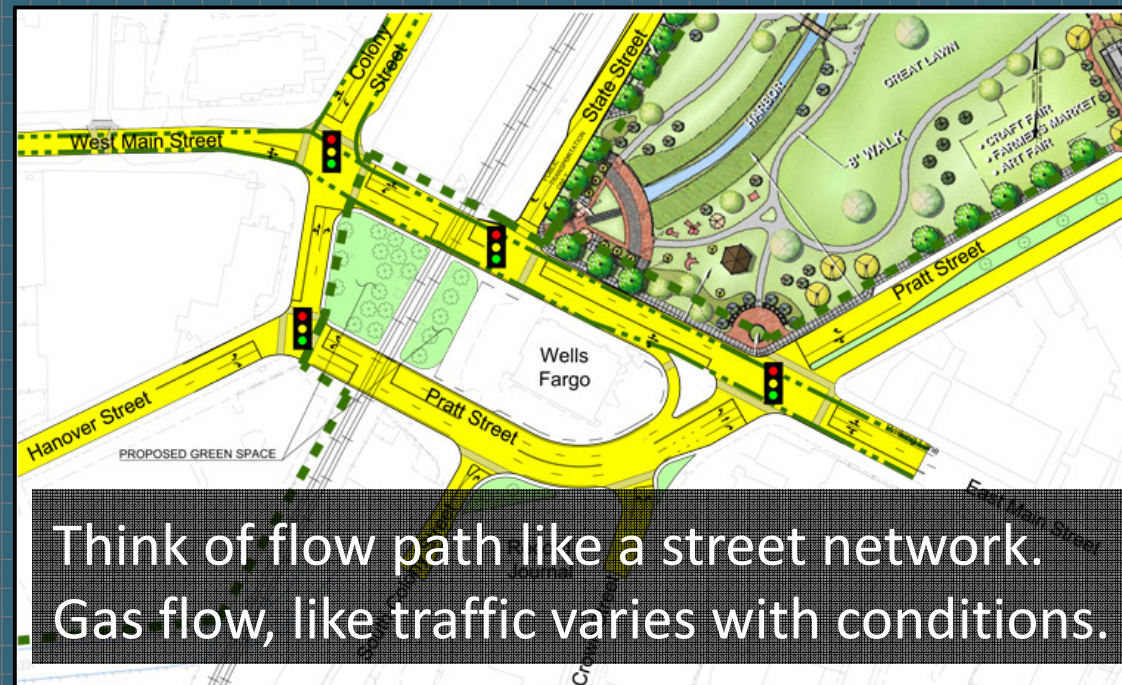
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# Flow Path & Air Track

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- Flow Path

*Volume of space between the inlet, the fire, and the outlet.*

- Air Track

*Movement of air and fire gases.*

*Challenges in language, terminology and translation...*

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Building configuration including windows, doors, and open interior stairways can have a significant impact on flow path from the fire to one or more exhaust points

*How can flow path be inferred from the B-SAHF Indicators?*



**Building ● Smoke ● Air Track ● Heat ● Flame**

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Existing and potential flow paths are a critical consideration!



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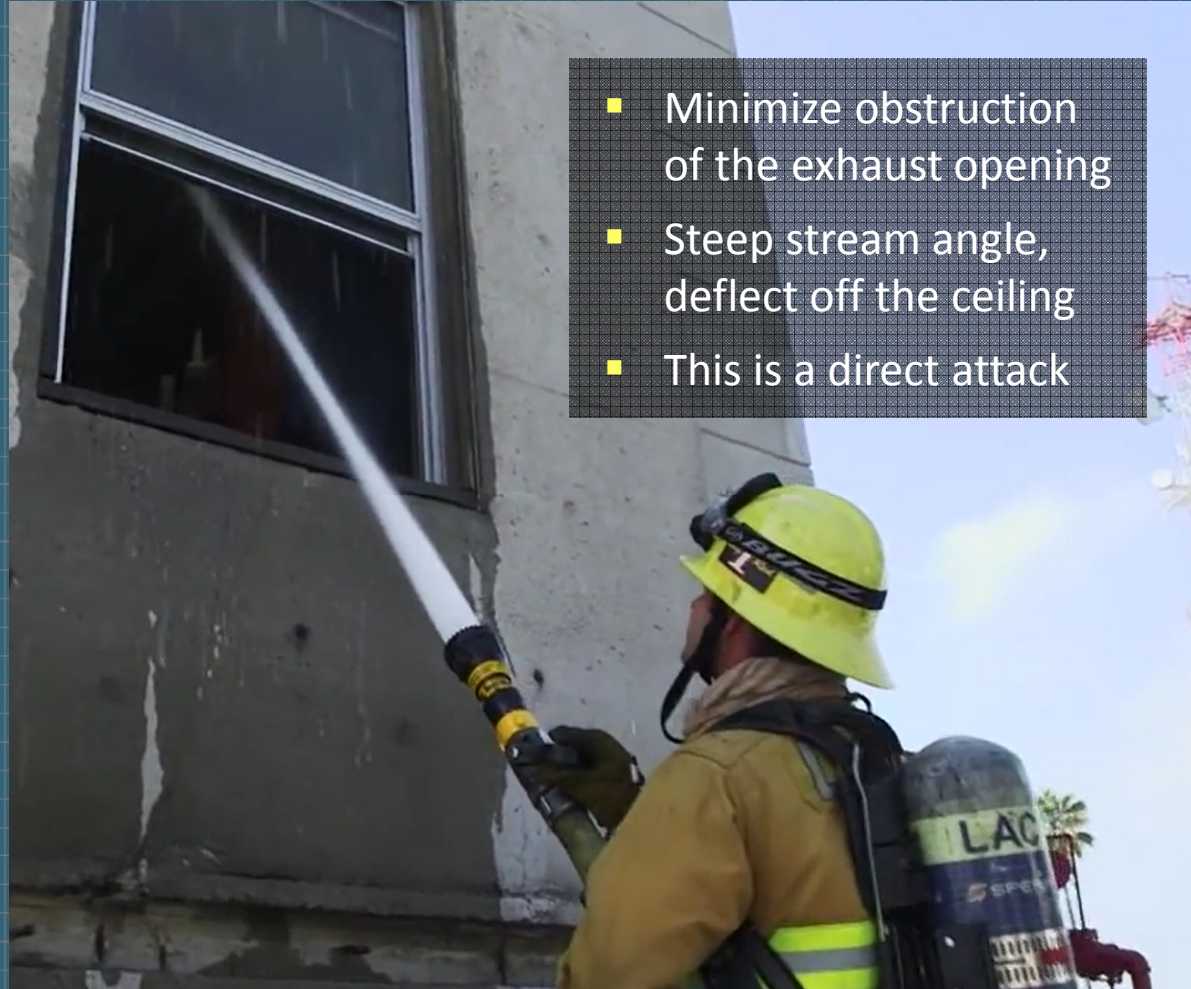
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- Minimize obstruction of the exhaust opening
- Steep stream angle, deflect off the ceiling
- This is a direct attack

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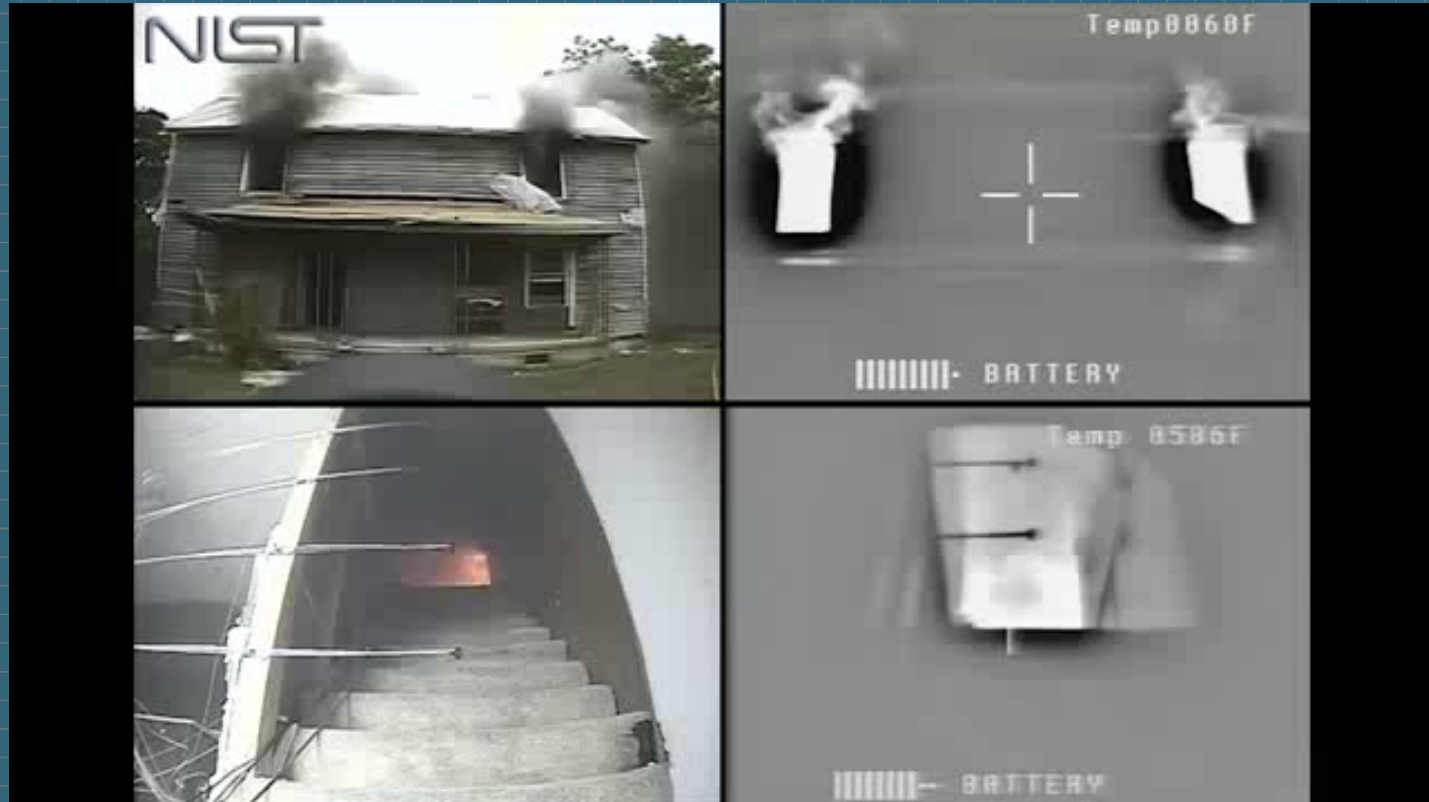
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- The fire has self-vented  
*(more on this later)*
- Water can be applied more quickly from the exterior
- Staffing will not permit interior attack
- Fire conditions will not permit interior attack
- Structural conditions will not permit interior attack

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# Indirect Attack

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What if the fire has not self-vented?

Are there other offensive exterior tactical options that may be applied?

- Fog Nails/Piercing Nozzles
- Cobra/Pyrolance
- Others?

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How should we approach integration of the use of exterior streams and those used from the interior?



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# Thank You

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