

Strategy, Tactics, and Decision Making for Structural Firefighting



Sensemaking

Practice

Naturalistic
Decision Making

Situational
Awareness

Research

Capabilitie &
Limitations

Day 1

Resources

Fire Dynamics

Strategy

Fire Control

Anti-Ventilation

Ventilation

Search

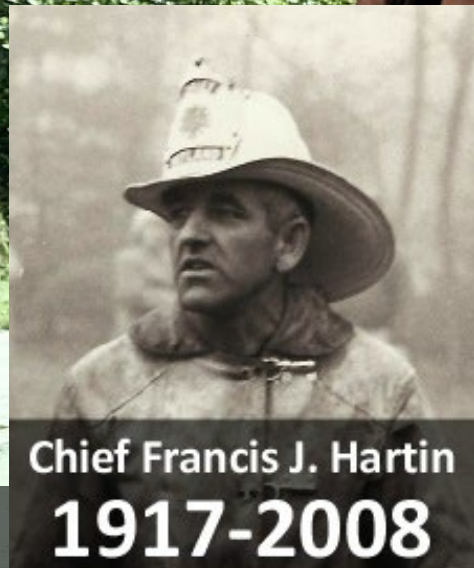
Tactics

CFBT-BE

Niet alleen wat en hoe, maar waasrom!



Chief Ed Hartin, MS, EFO, FI FireE, CFO



Learning the Craft Since 1974 1954





23 April 1974



28 February 2025





Backdraft



Definitions



Signs

1. ☐ A ☒ B ☐ C ☐ D
2. ☐ A ☐ B ☐ C ☒ D
3. ☒ A ☐ B ☐ C ☐ D
4. ☐ A ☐ B ☒ C ☐ D
5. ☐ A ☐ B ☐ C ☒ D
6. ☐ A ☒ B ☐ C ☐ D
7. ☐ A ☒ B ☐ C ☐ D
8. ☐ A ☐ B ☒ C ☐ D
9. ☒ A ☐ B ☐ C ☐ D
10. ☐ A ☐ B ☐ C ☒ D

A Difficult Question



Why did Ava's
dad die in a fire?

5-7 Lo
Worce
Decem



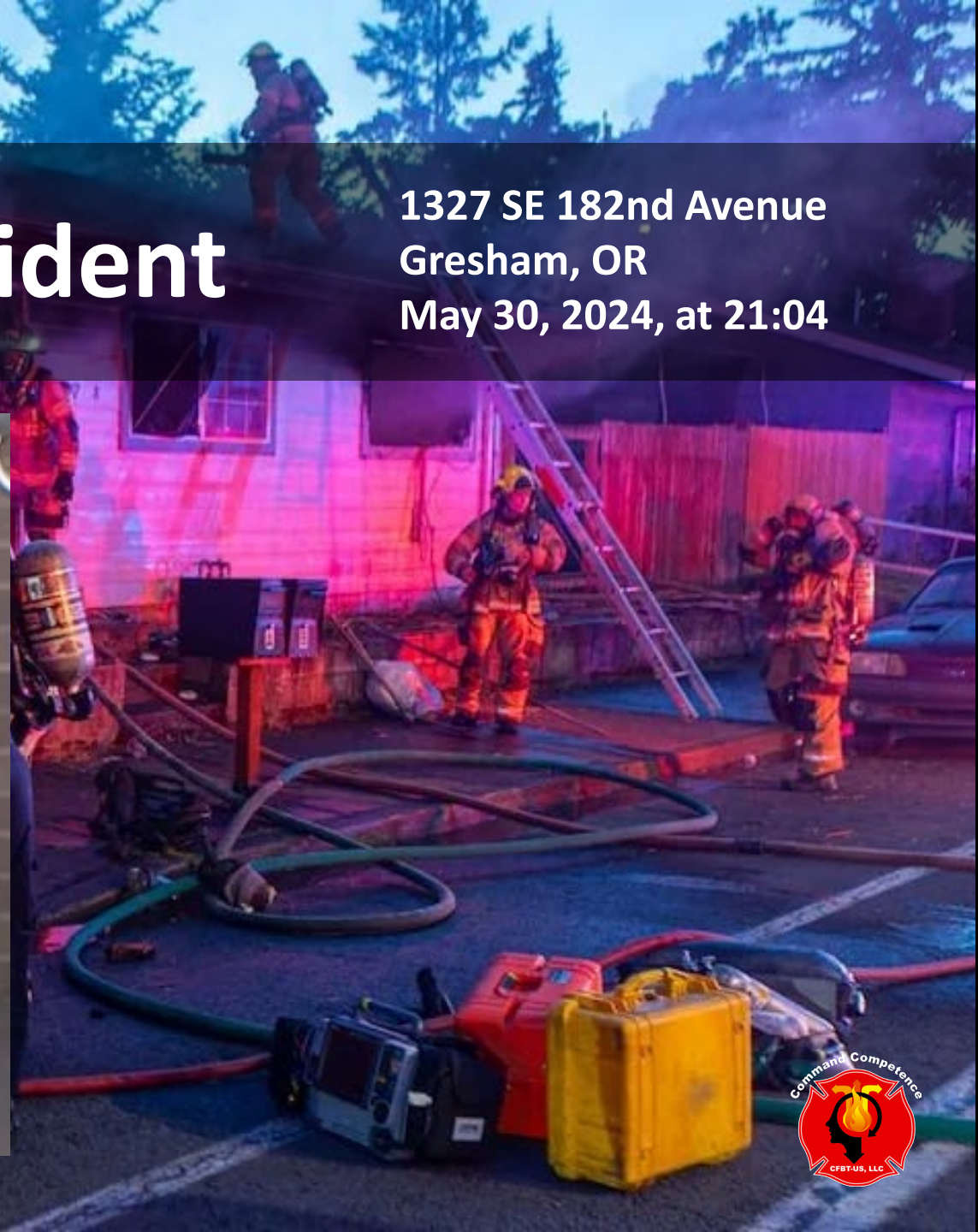
0:00:00





Serious Injury Incident

1327 SE 182nd Avenue
Gresham, OR
May 30, 2024, at 21:04





In order to carry on your business properly, *it is necessary for those who practice it to understand not only what they have to do, but why they have to do it...*

No fireman can ever be considered to have attained a real proficiency in his business until he has thoroughly mastered this *combination of theory and practice.*



Great Fire of London 1666

Fire Protection, *1876*
Sir Eyre Massey Shaw
Chief, London Fire Brigade



Introductions

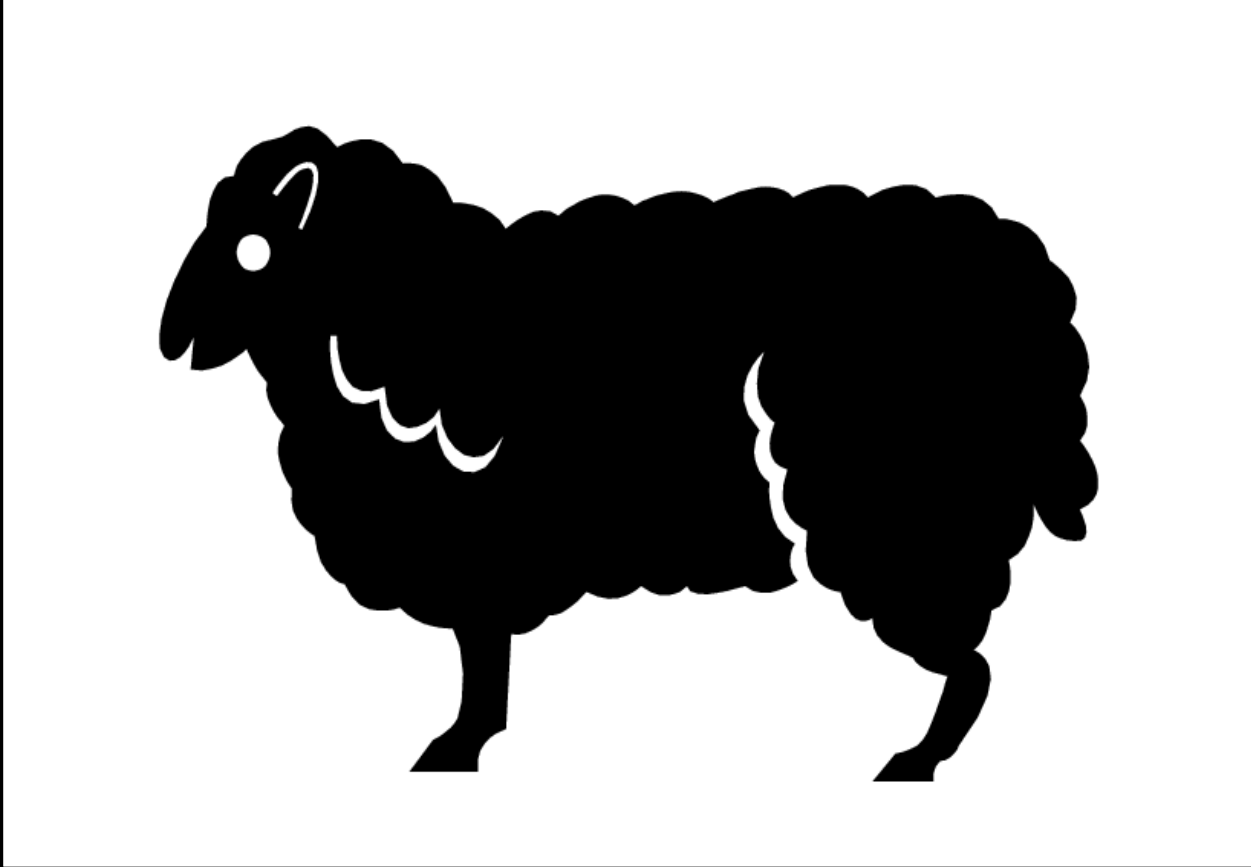
- Who are you?
- Where are you from?
- Where do you work?
- How long have you been a firefighter?
- What is one thing that has significantly impacted your structural firefighting operations over the course of your career?

What Does Good Look Like?



Critical Thinking!

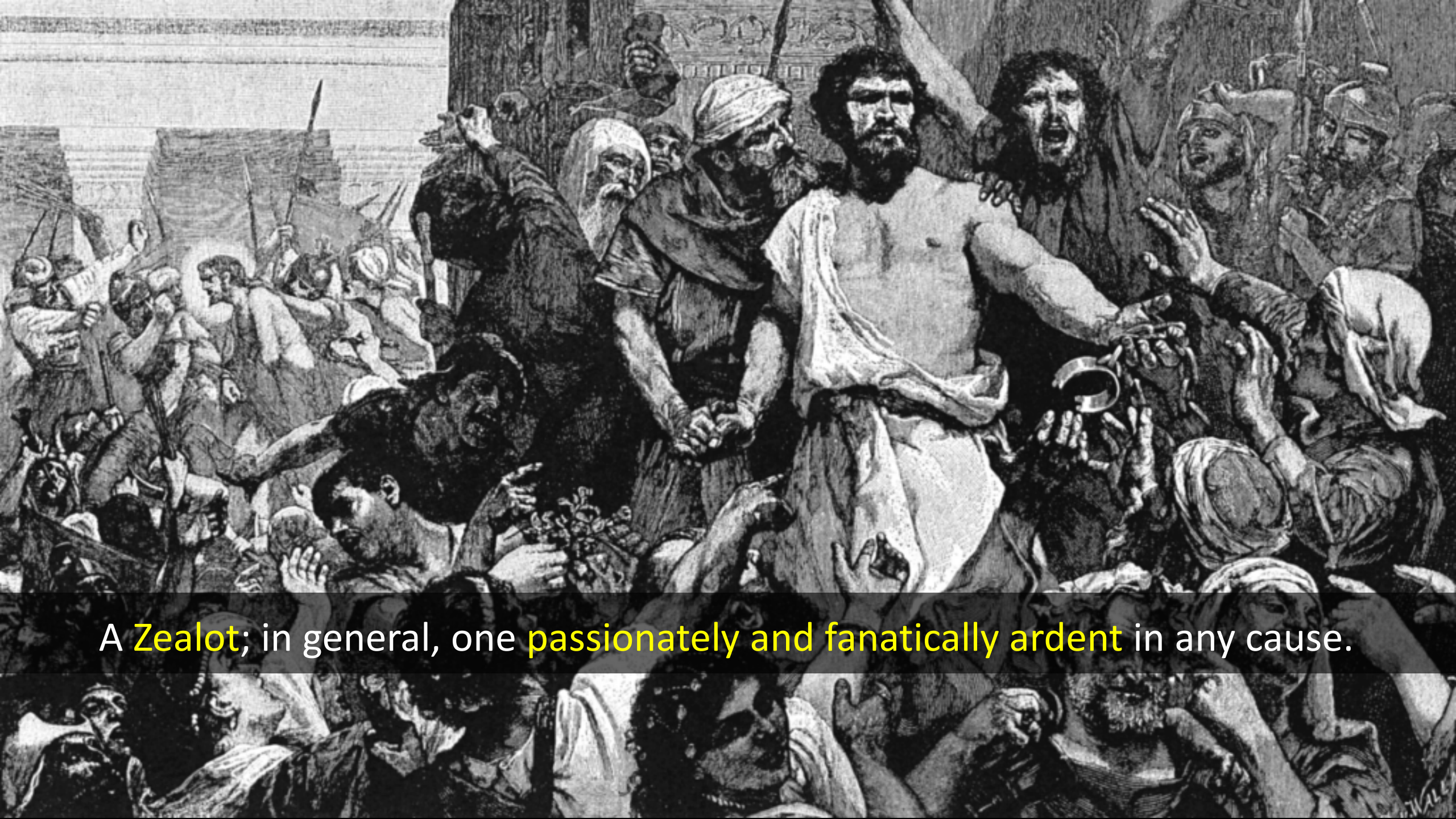
Limits of Observation



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



*What conclusions do we
draw from our experience?*



A **Zealot**; in general, one **passionately and fanatically ardent** in any cause.

Learning Outcomes

- Gain perspective on changes in the fire service over the last 50 years (and beyond).
- Develop an understanding of the value and limitations of qualitative and quantitative data dealing with fireground operations.
- Explore fireground sensemaking and decision making.

Learning Outcomes

- Use National Fire Protection Association (NFPA) 1700 Guide to Structural Firefighting to explore international best practices.
- Develop an understanding of accountability and management of fireground operations.
- Figure out the answer to the question “What does good look like?”

Methodology

- Interactive Presentation
- Distributed Reading
- Tactical Decision Games (TDGs)
- Small and Large Group Activities

Form 5 Working Groups

Consider the following:

- Approximately equal size.
- Ideally you will work with participants from other agencies and other countries.
- Consider language skills.
- Consider rank and role in your organizations
- Consider experience levels



**Diversity
&
Balance!**

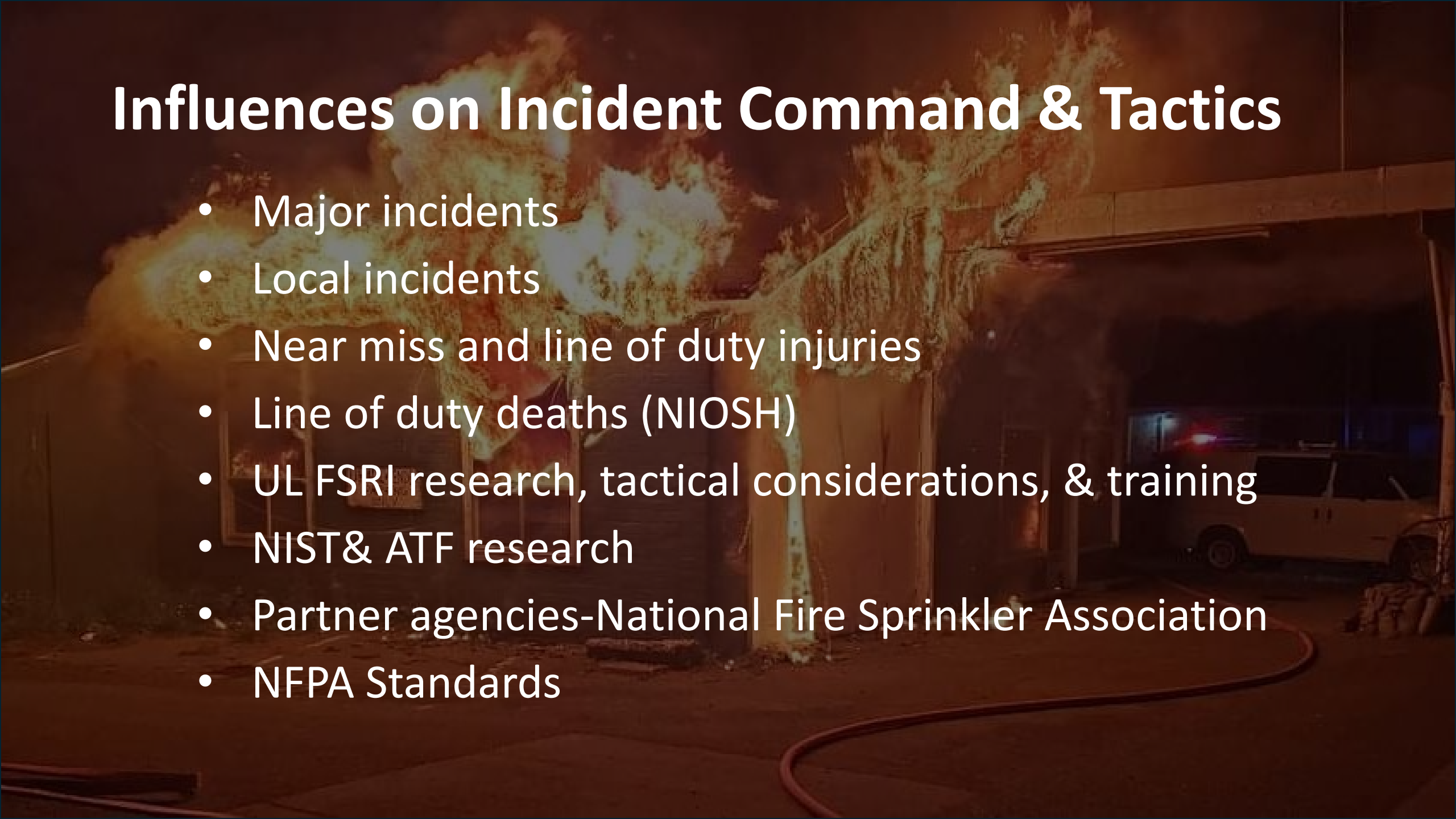


Fire
Behavior

Building
Construction

Operational
Capability

Influences on Incident Command & Tactics

A photograph of a building on fire at night. The fire is large and intense, with bright orange and yellow flames rising from the structure. A fire truck is visible in the background, and a fire hose is laid out on the ground in the foreground. The scene is dark, with the fire providing the primary light source.

- Major incidents
- Local incidents
- Near miss and line of duty injuries
- Line of duty deaths (NIOSH)
- UL FSRI research, tactical considerations, & training
- NIST& ATF research
- Partner agencies-National Fire Sprinkler Association
- NFPA Standards

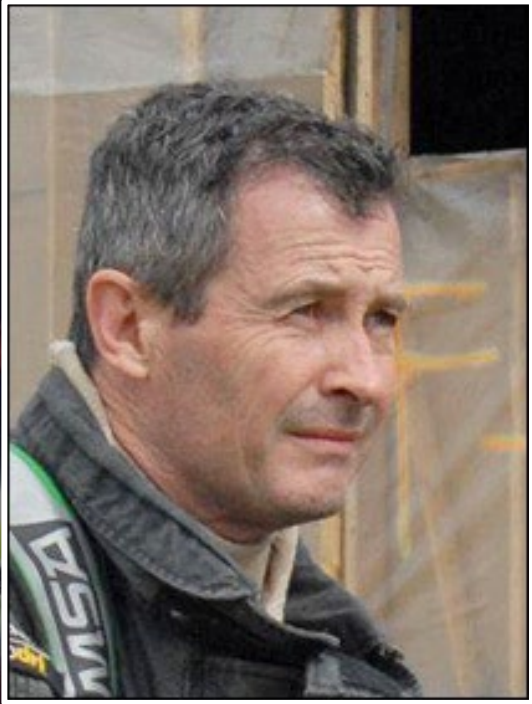
There are 3 Operational Levels on all Incidents that have an IDLH Hazard Zone:

- Strategic Level
- Tactical Level
- Task Level



These levels are often performed by different people:
Working (Task Level) Boss, Walking (Tactical) Boss, Sitting (Strategic) Boss

Which Comes First?



- Strategy
- Tactics
- Tasks



Inspector John McDonough

RECEO-VS

Rescue

Exposures

Confinement

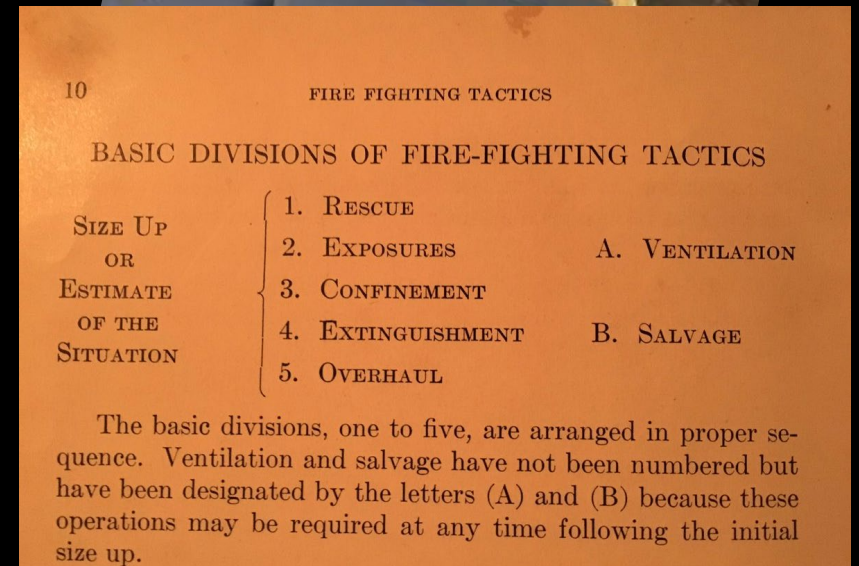
Extinguishment

Overhaul

*Lloyd Layman never
used the acronym!*

Ventilation

Salvage



1940

RECEO-VS Reimagined

Exposures

Confinement

Extinguishment

Rescue

Ventilation

*Rescue, Fire Control
& Ventilation as
Concurrent Operations**

Overhaul

Salvage

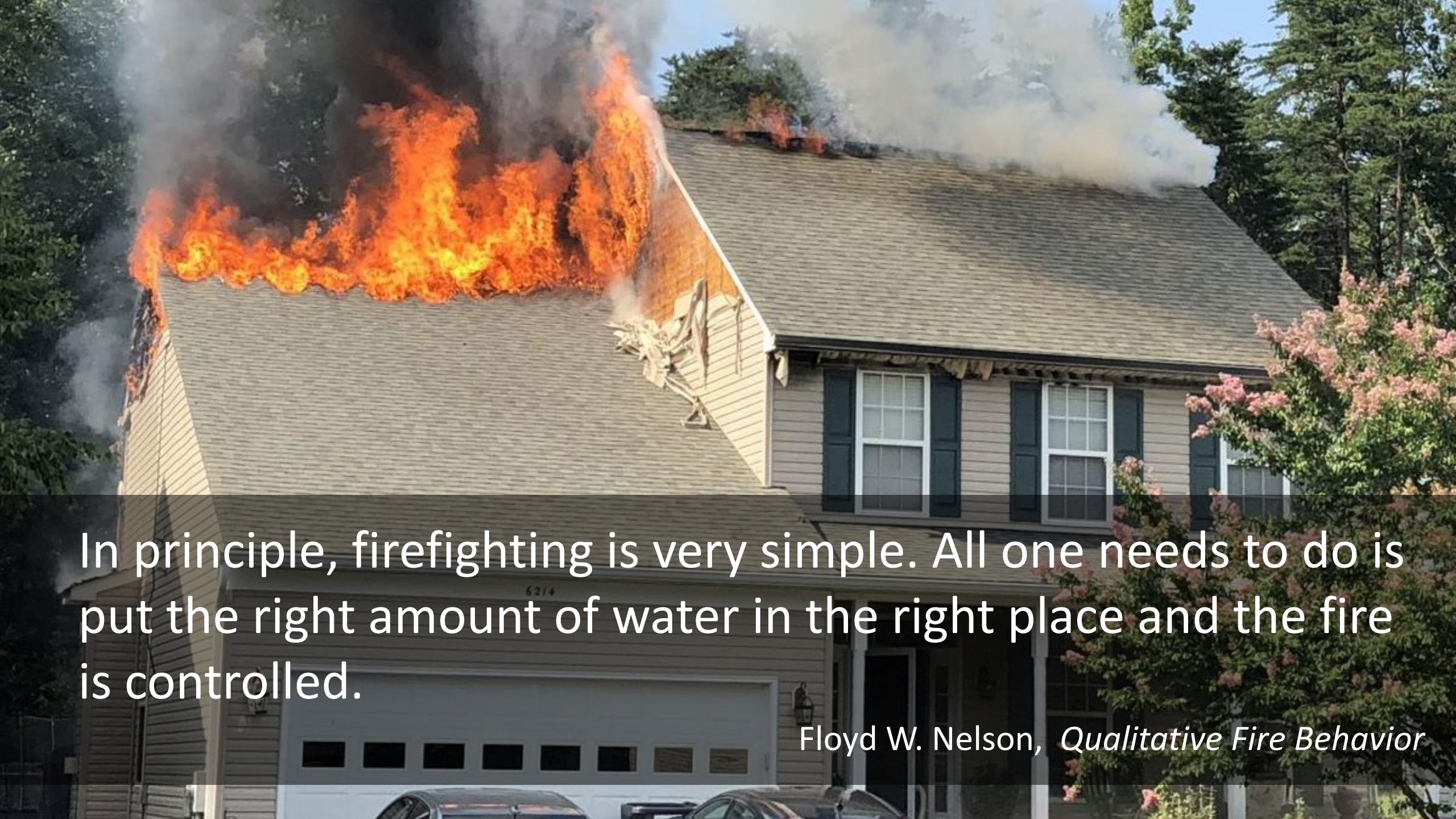
* If staffing permits...



Water for Fire Control 1824-Present



From James Braidwood to Underwriters Laboratories Fire Safety Research Institute

A photograph of a two-story house with a grey shingled roof. A large fire is burning along the ridge of the roof, with bright orange and yellow flames visible. Thick white and grey smoke is rising from the fire, filling the upper part of the frame. The house has light-colored siding and dark shutters on the windows. A white garage door is visible on the ground floor. The house is surrounded by green trees and a flowering bush with pink blossoms on the right side.

In principle, firefighting is very simple. All one needs to do is put the right amount of water in the right place and the fire is controlled.

Floyd W. Nelson, *Qualitative Fire Behavior*

Where, What, & How

Exterior Attack

Water Mapping (Distribution)

Interior Attack

Flow Rate & Pressure

Nozzle Type

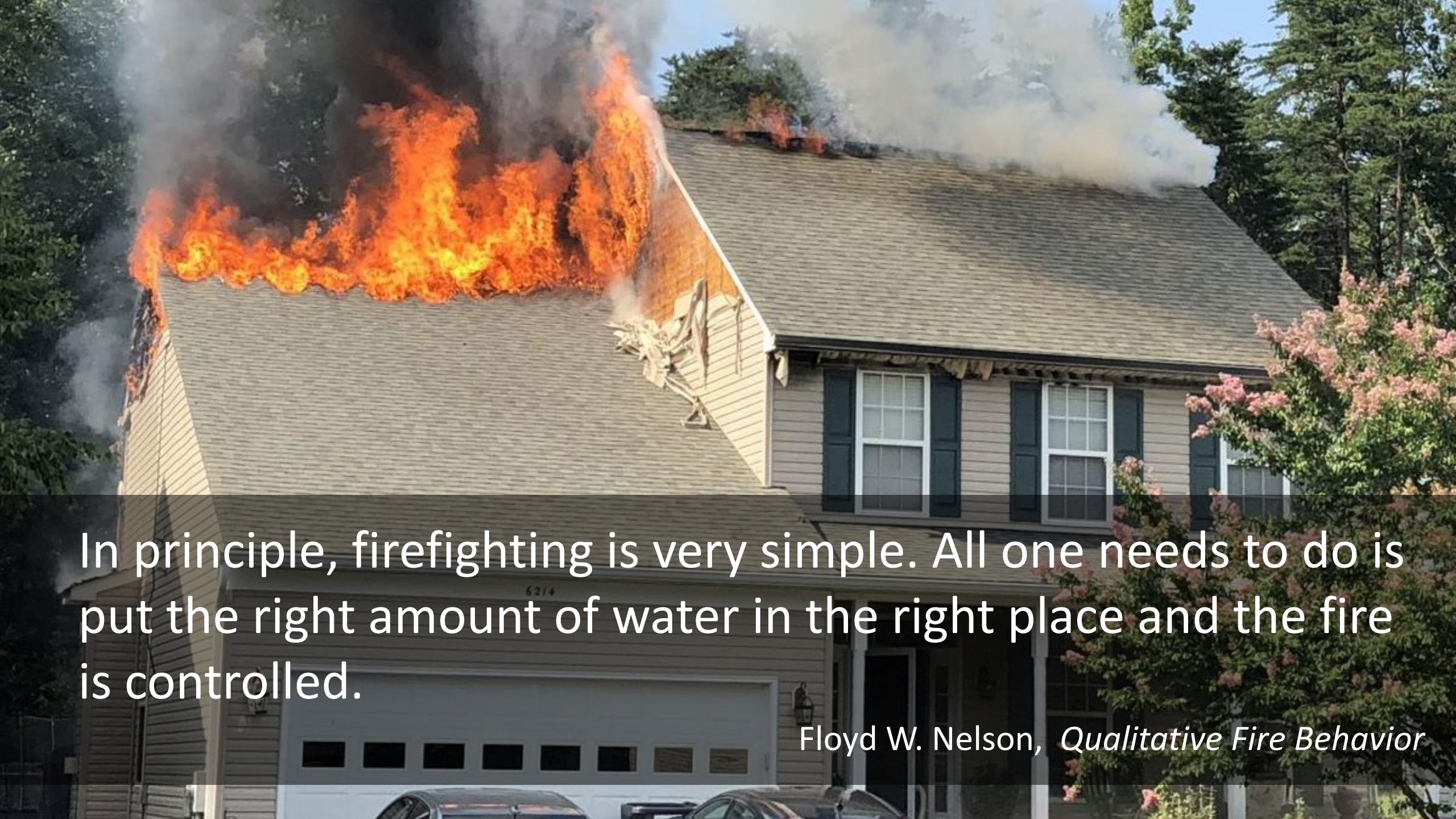
Direct Attack

Indirect Attack

Combination Attack

Gas Cooling



A photograph of a two-story house with a grey shingled roof. A large fire is burning along the ridge of the roof, with bright orange and yellow flames visible. Thick white and grey smoke is rising from the fire, partially obscuring the sky. The house has light-colored siding and dark shutters on the windows. A white garage door is visible on the ground floor. The house is surrounded by green trees and a flowering bush with pink blossoms on the right side.

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Combination Attack

Gas Cooling



Firefighting Context



James Braidwood

1800-1861

1824 he was made Master of the Fire Engines in Edinburg, Scotland.

1833 moved to London and to form the London Fire Engine Establishment (consolidating 10 fire insurance fire brigades into a public fire service.

1861 Died in the line of duty from a wall collapse in the Tooley Street fire.



Braidwood's Most Important Lessons



Quick and effective water application
in a direct attack

- Exterior application
- Interior application

Limit air flow to the fire

Speed is of the essence

Eyre Massey Shaw

1828-1908

1860 Chief Constable and the
Superintendent of Fire Services in Belfast

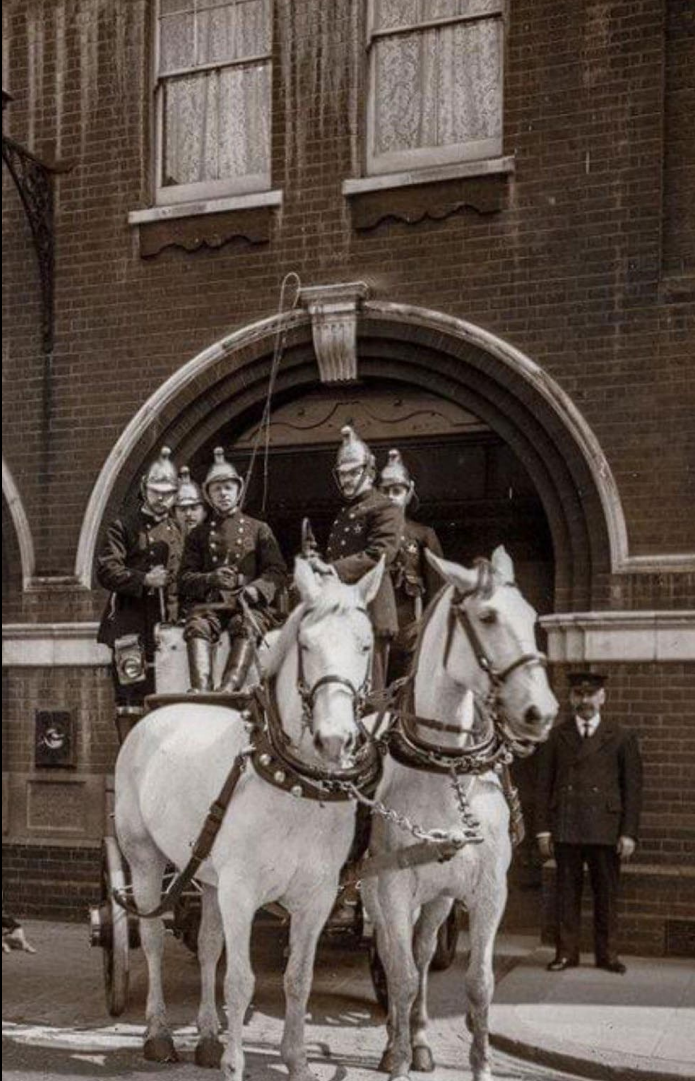
1861 Superintendent of the London fire
Engine Establishment.

1866 Chief Fire Officer of the
Metropolitan London Fire Brigade

1891 Retired



Shaw's Most Important Lessons



Experience is necessary, but not sufficient

Ventilation and anti-ventilation

Factors that influence fire stream performance

Coordinated fire attack

John Kenlon

1861-1940

Firefighter, New York Fire Department 1887

Foreman, New York Fire Department 1887

Promoted to Battalion Chief 1905

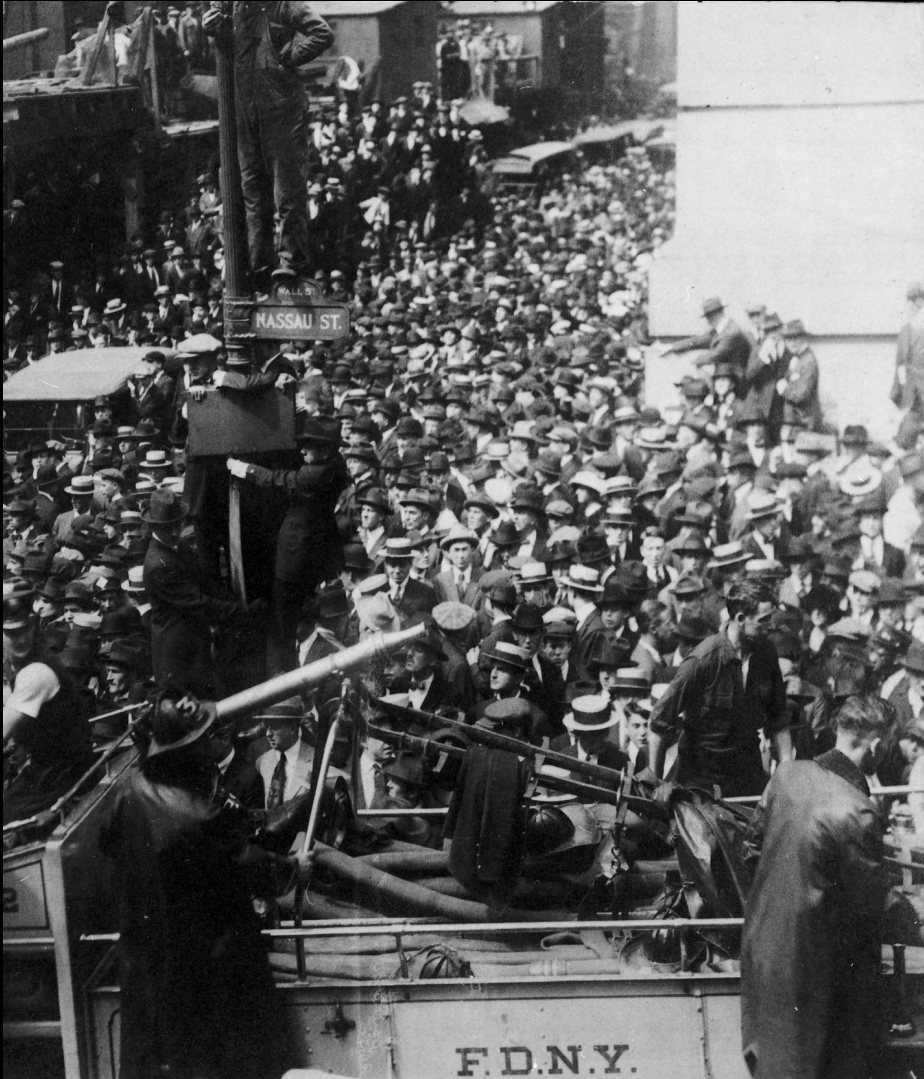
Promoted to Deputy Chief 1909

Appointed Chief, New York Fire
Department 1911

Retired 1931



Kenlon's Most Important Lessons



In many respects fires behave in a predictable manner

Scientific training is necessary

Regrowth during strategic shift

Backup lines are important

Decisions must be made in a timely manner

Context is critical

Fire Chief's Handbook

Fred Shepperd, Editor

In many respects this text was written to be all things to all firefighters, regardless of rank, from probationary firefighter to chief of department.



Shepperd's Most Important Lessons

Scientific concepts related to chemistry & physics of fire

Importance of water distribution and water mapping for interior and exterior streams

The amount of water needed is smaller if distributed on the burning fuel and ineffective water distribution can result in significant water damage

Nozzle discipline (not simply to hold your water)

Well advanced basement fires should be attacked before entry

Lloyd Layman

1897-1968

Served in the US Army in WW I

Appointed as Trooper with West Virginia State Police **1919** (rose to the rank of Captain).

Appointed Chief Parkersburg West Virginia Fire Department **1931**

Commander USCG **1942-1947**

Retired **1951**



**FIRE FIGHTING
TACTICS**

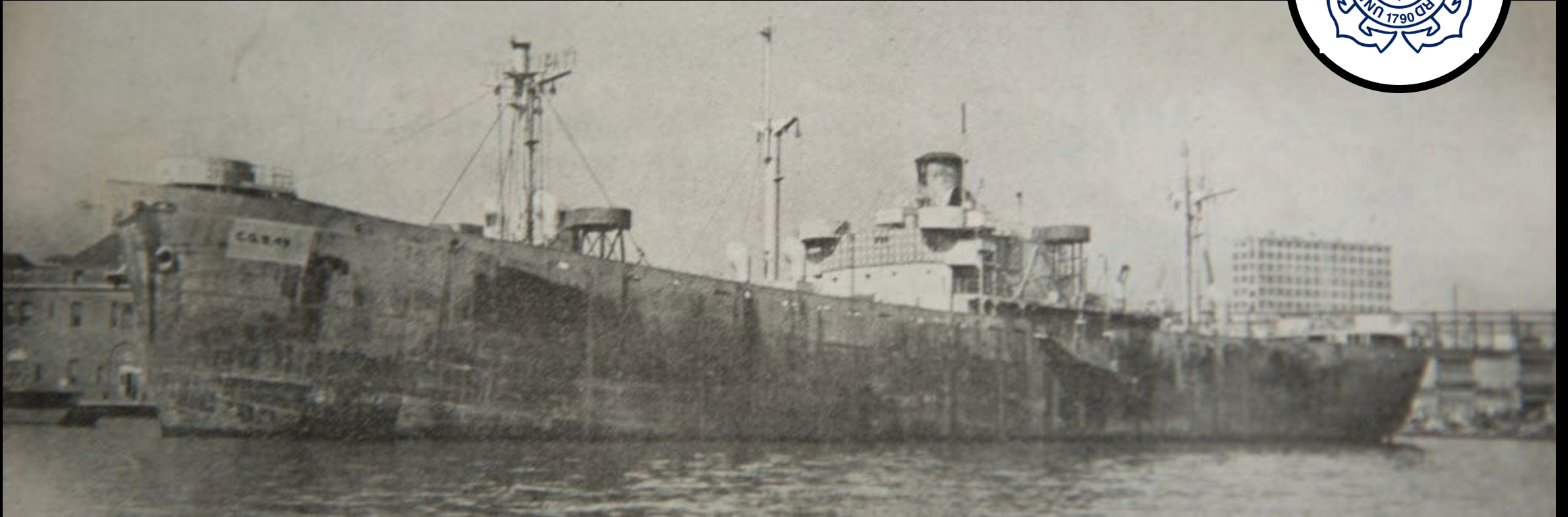
**Fundamentals
OF
Fire Fighting Tactics**

**ATTACKING and
EXTINGUISHING
INTERIOR FIRES**

Firefighting Context

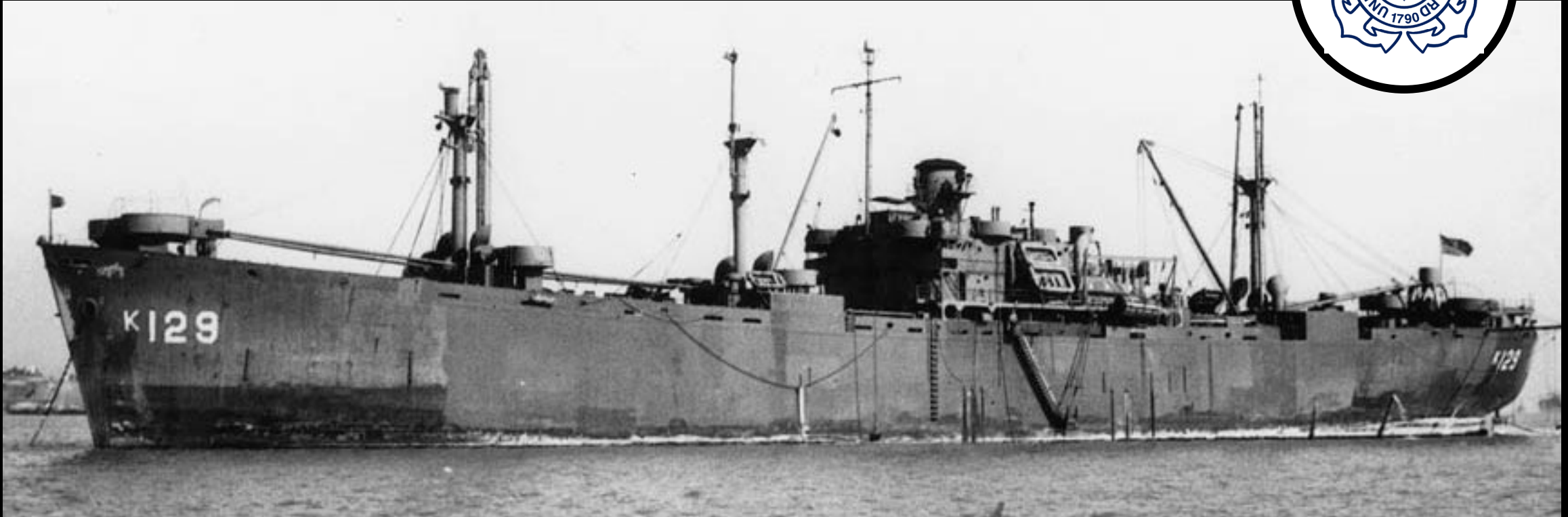


SS Gaspar Deportola (CGB-49)



Layman used this ship as his first full scale laboratory to investigate fire control in ship engine rooms and developed the theory of indirect application and atmospheric displacement.

USS Phobos (K129)



Layman used this ship as his second full scale laboratory investigate fire control in ship cargo holds.



Transition to Building Fires

Returning to the Parkersburg, West Virginia Fire Department after completing his wartime service with the United States Coast Guard, Layman recognized that “there were many questions regarding the practicability of employing water in the form of finely divided particles for general fire-fighting purposes” (Layman, 1960, p, 37).

Little Drops of Water – 1950 FDIC

This result [maximum vaporization] cannot be obtained by applying water in the form of a solid stream... Little if any progress can be made in improving the tactical employment of water in fire fighting operations until the gross ineffectiveness of the solid stream method of application is recognized.

Little Drops of Water – 1950 FDIC

The theory of indirect application and atmospheric displacement is based on two simple principles: 1) The cooling action of water, applied in the form of finely divided particles [and vaporized] within a highly heated confined space, is not restricted to the area of direct contact. 2) Expansion of steam will displace the atmosphere in the space and transfer heat to the outside atmosphere.

Indirect Attack

- Limitation of ventilation before fire control
- Application of water fog in the upper area
- Absorption of thermal energy from hot gases and surfaces
- Mixing due to convection
- Increased pressure due to steam expansion
- Continued cooling and contraction of steam
- Timely direct attack is required to complete extinguishment

Royer & Nelson

Iowa State University
Fire Service Training

How much water for fire control (Royer & Nelson, 1982)

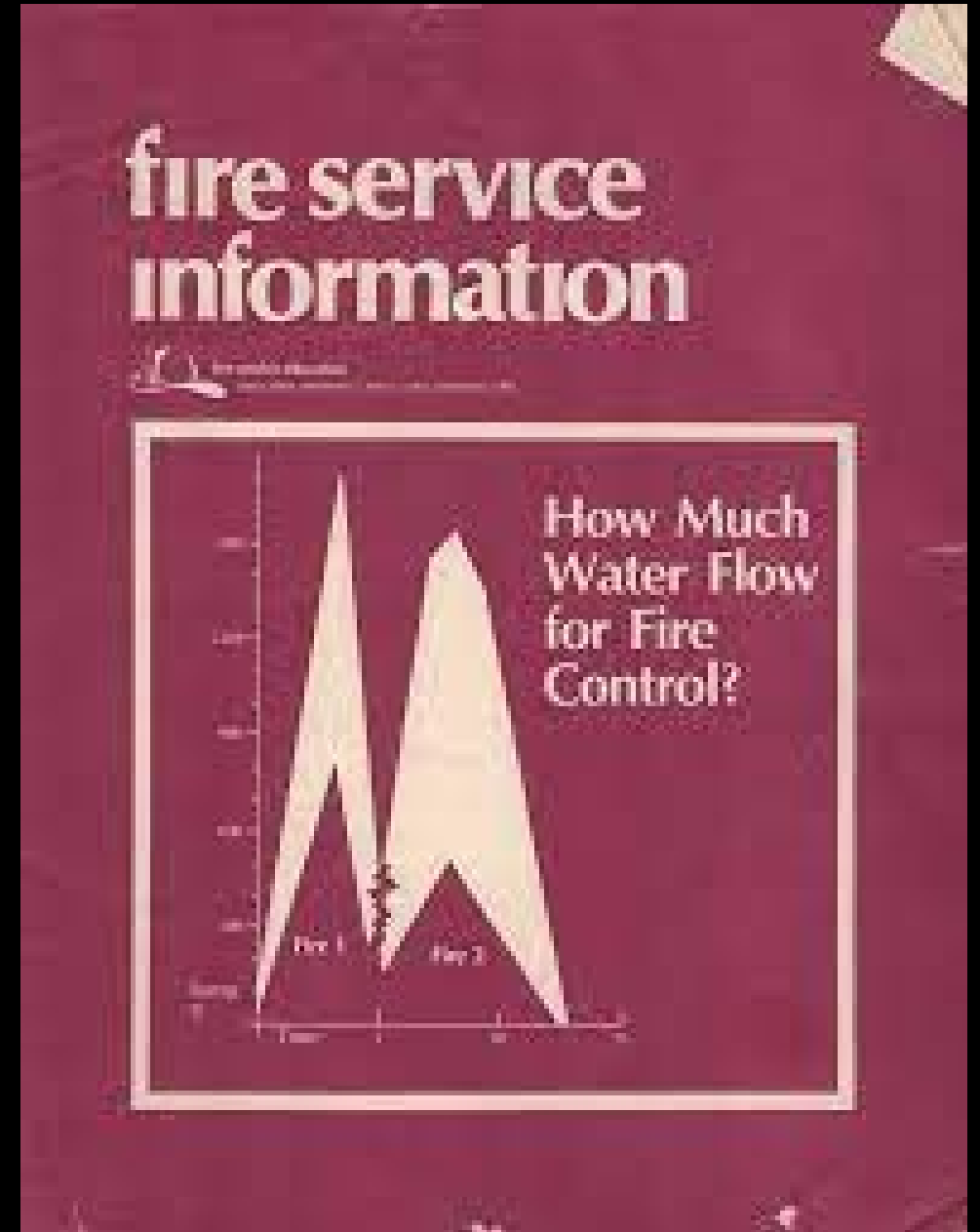
Water for firefighting (Royer & Nelson, n.d.)

Qualitative fire behavior (Nelson, 1991)



How Much Water?

Royer & Nelson conducted a great deal of research on required fire flow, developing what would become known as the Iowa Rate of Flow Formula.



Royer & Nelson on Nozzle Technique

The combination attack integrates both direct and indirect methods using a fog pattern **adjusted to reach across the entire area, rotating the nozzle in a clockwise 'O' pattern.**

Royer & Nelson (n.d.) referenced Folke who emphasized the need for **adequate pressure** [velocity] and who cited Stanzig as writing **"The nozzle pipe movement must be just as violent as bayonet fighting"**

Royer & Nelson on Nozzle Technique

Royer & Nelson cautioned against over application (flow too high or adequate flow for too long).

When the rate of flow is substantially greater than ideal, the **temperature drop in the fire area will be very rapid**, steam production will be limited, and **heat production will increase in remote areas** (Royer & Nelson, n.d., p. 3)



Rosander & Giselsson

Swedish Fire Service

Extinguishing with the Fogfighter (Rosander & Giselsson, 1994)



Fire Control & Extinguishment

Rosander & Gisselsson discuss several methods of fire control including **indirect attack** (Layman) and the Swedish model of **gas cooling** as well as extinguishment using **direct attack**.

Gas Cooling

Gas cooling in the Swedish model applies small droplets (<0.3 mm) to **cool hot gases without vaporizing on contact with surfaces**. Cooling the gases results in contraction (to a greater extent than expansion of the water vaporized into steam). *More on this later!*

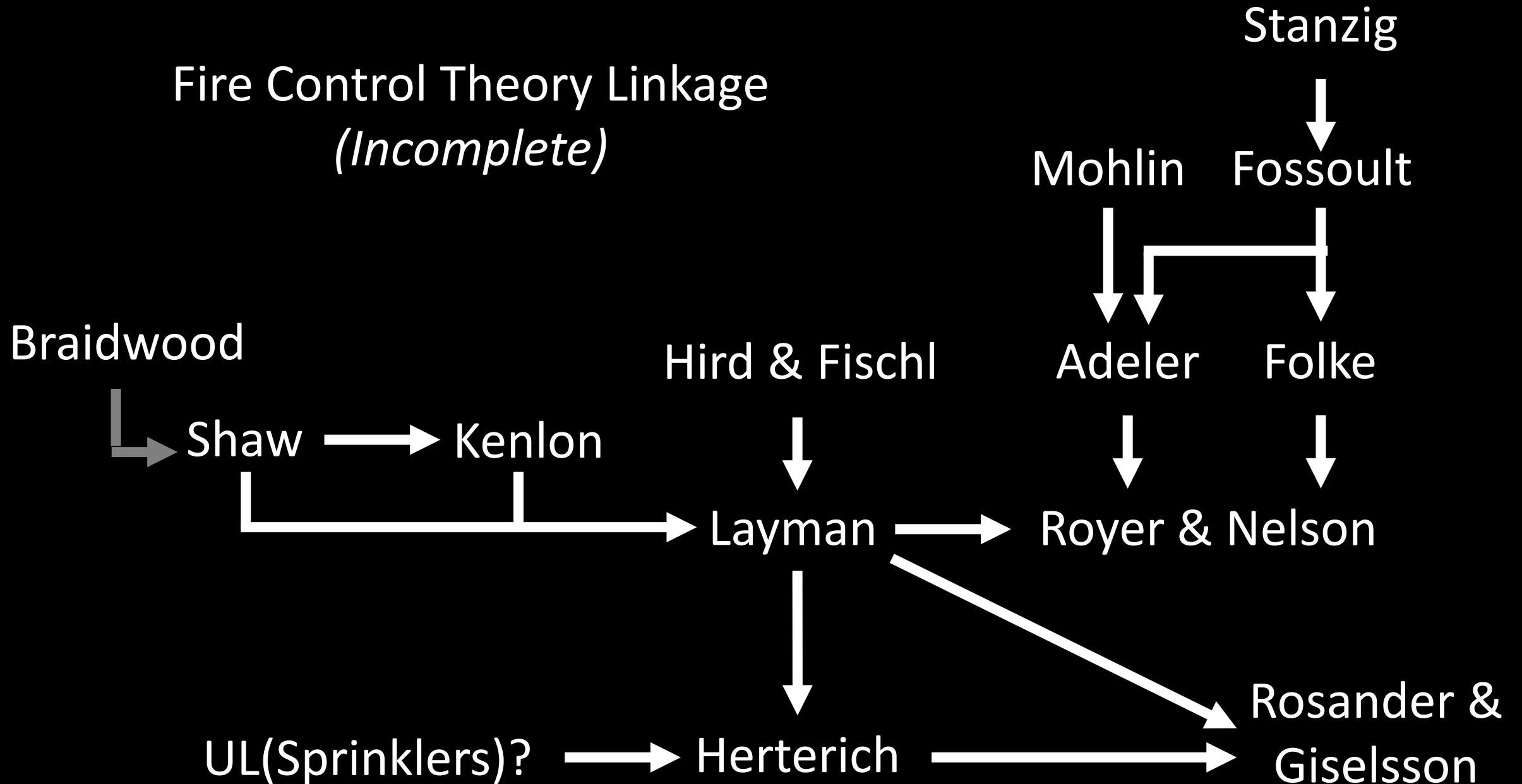
Gas Cooling

Is not an extinguishment technique!



Cooling hot gases overhead is done to reduce risk when approaching a shielded fire.

Fire Control Theory Linkage (*Incomplete*)



Vaporization in the Gas Layer

- Water vaporized in the upper layer takes energy from the hot gases, lowering their temperature.
- It takes much more energy to heat and vaporize water than to cool hot gases.

*Specific Heat
of Smoke
0.001 MJ/kg*

VS

*TCC of Water
2600 kJ/kg
(2.6 MJ/kg)**

** Water at 20° C to Steam at 100° C*

Vaporization in the Gas Layer

- Small droplets are effective in cooling the gases
- Duration of application and cone angle depend on the size of the space



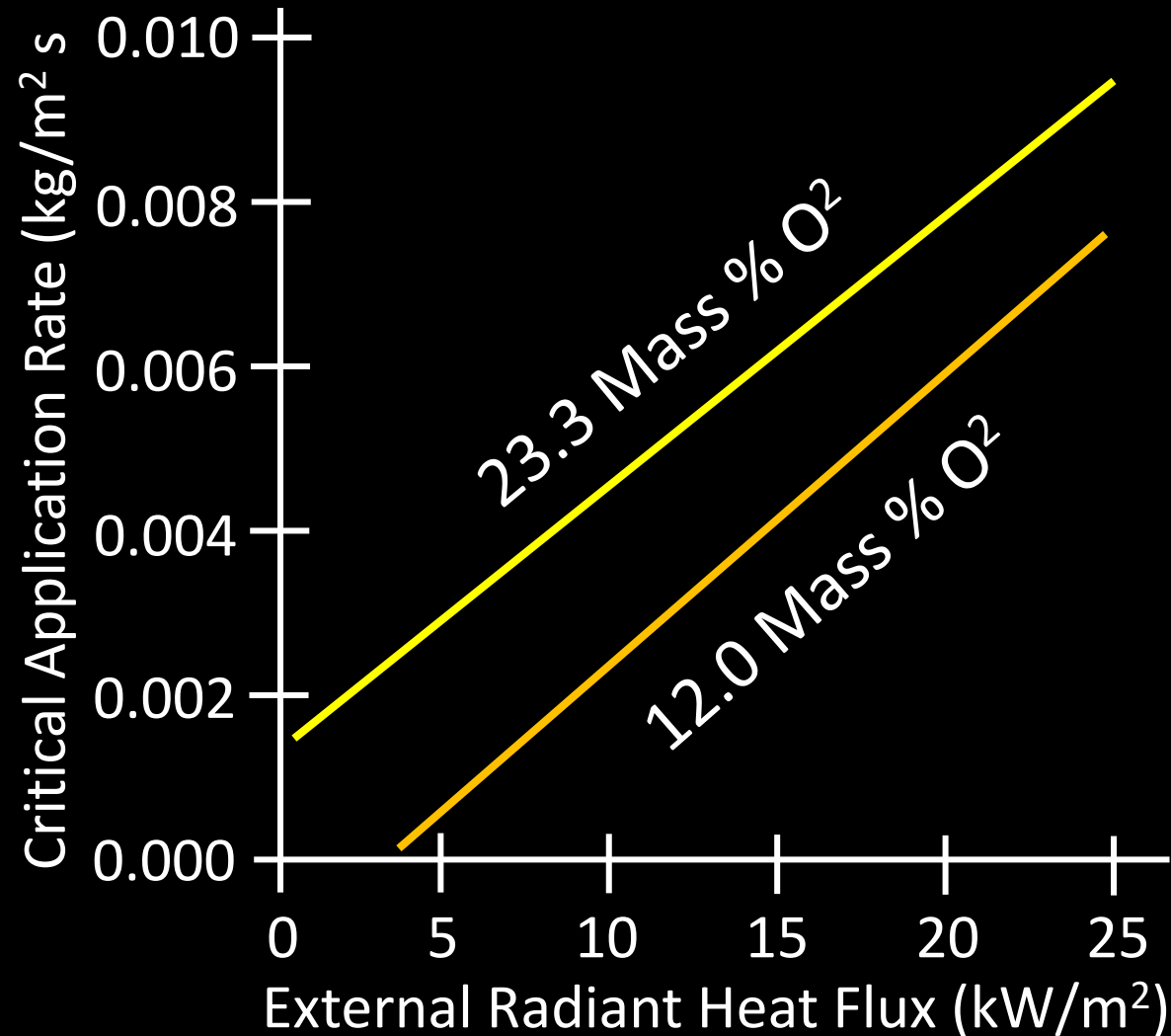
If $> 35\%$ of the water is vaporized in the upper layer, the layer will contract.

Extinguishing Diffusion Flames by Surface Cooling

- Extinguishment requires application of water to burning surfaces
- The required flow rate per m^2 is quite low if the time for extinguishment is infinite



Critical Flow Influencing Factors

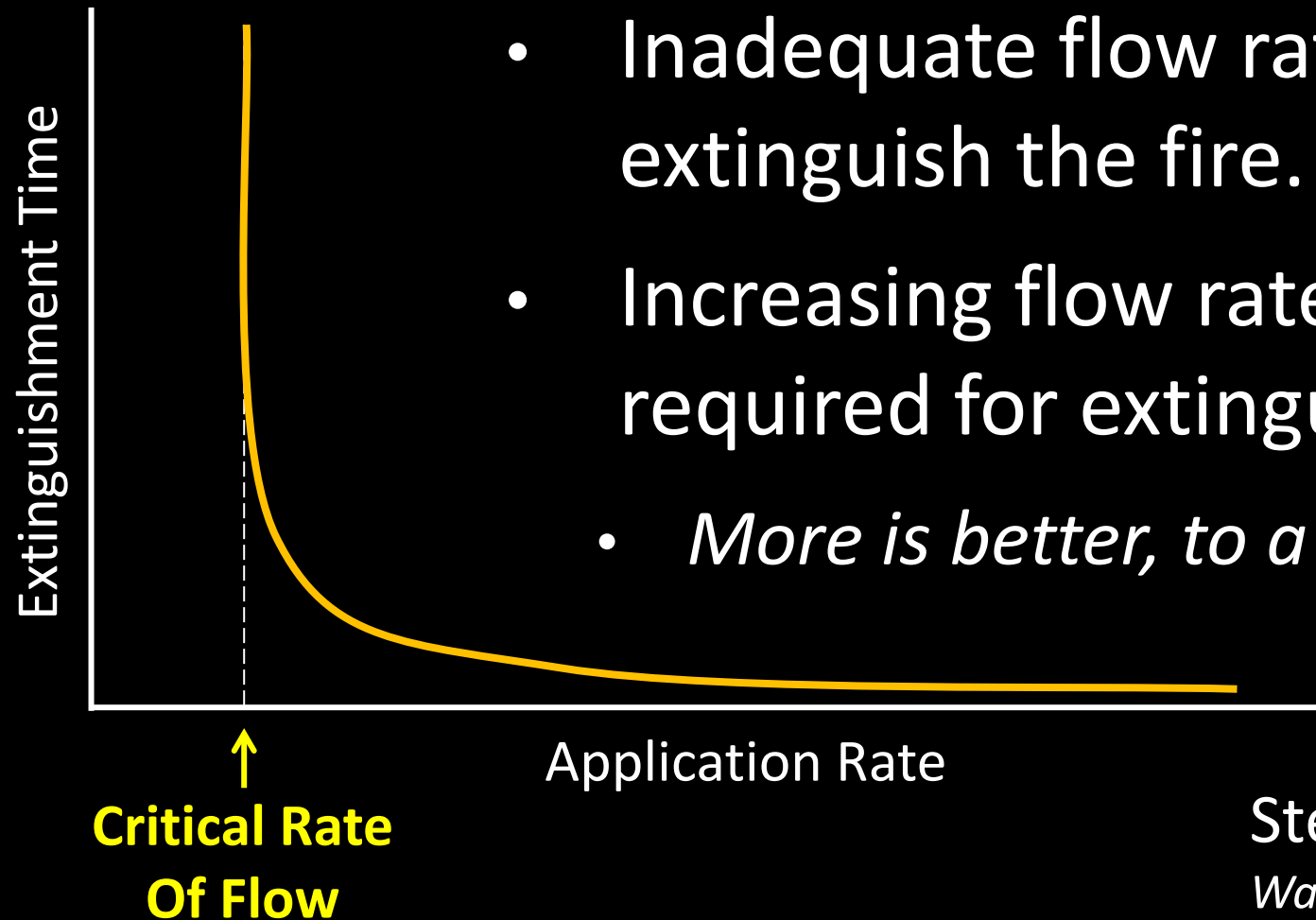


- Radiant Heat Flux
- Oxygen Concentration

Stefan Särndqvist

Water and Other Extinguishing Agents (p. 317)

Critical Rate of Flow

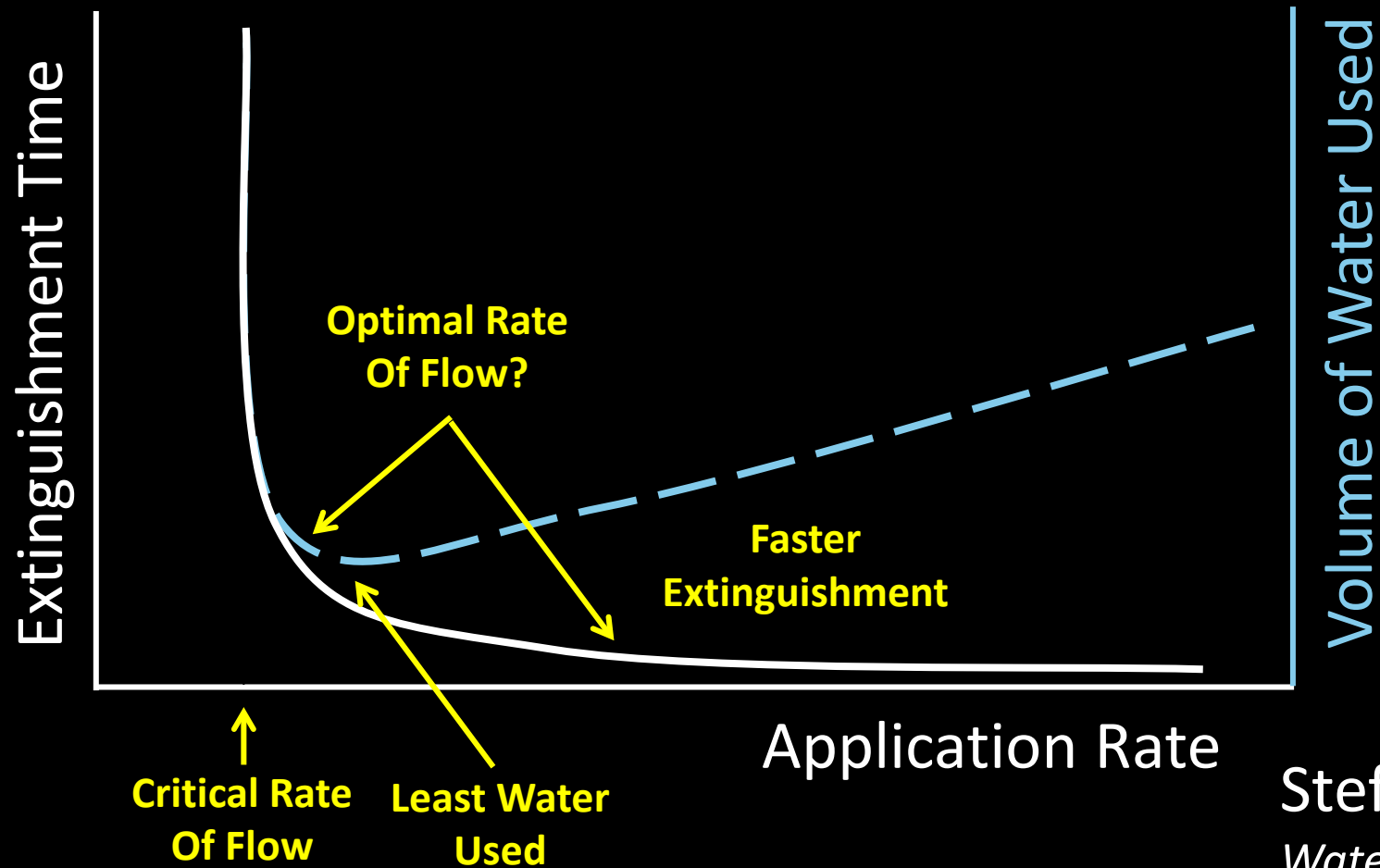


- Inadequate flow rate will fail to extinguish the fire.
- Increasing flow rate reduces the time required for extinguishment.
- *More is better, to a point...*

Stefan Särndqvist

Water and Other Extinguishing Agents (p. 21)

Flow, Time, & Water



- Effectiveness
- Efficiency

What's the difference?

Is this a question of one, the other, or both?

Stefan Särndqvist

Water and Other Extinguishing Agents (p. 21)

Surface Cooling

- Water may be applied to cool burning fuel, pyrolizing fuel packages or to cool uninvolved surfaces.
- Surface cooling is a critical element in fire control and extinguishment.





JUST BECAUSE
Water is es

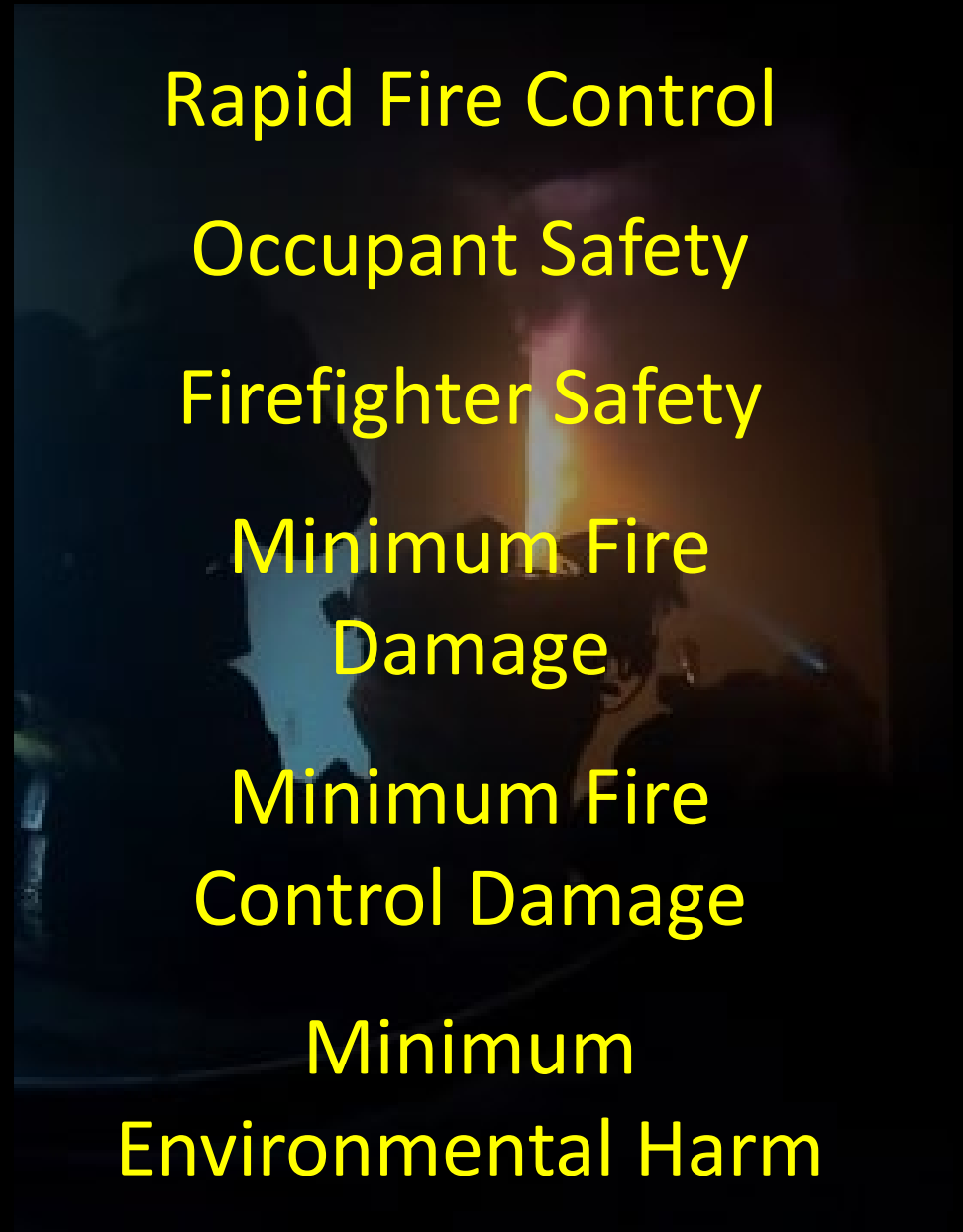
Vaporization on Surfaces

- Water vaporized on hot surfaces does not take as much energy from hot gases (as water vaporized in the gases).
- Steam produced on surfaces will add to the hot upper layer (1700:1 at 100° C) increasing thermal ballast.



Effectiveness

- The degree to which something is successful in producing a desired result.
- When deploying and operating an attack line for fire control, what are the desired results?



Rapid Fire Control

Occupant Safety

Firefighter Safety

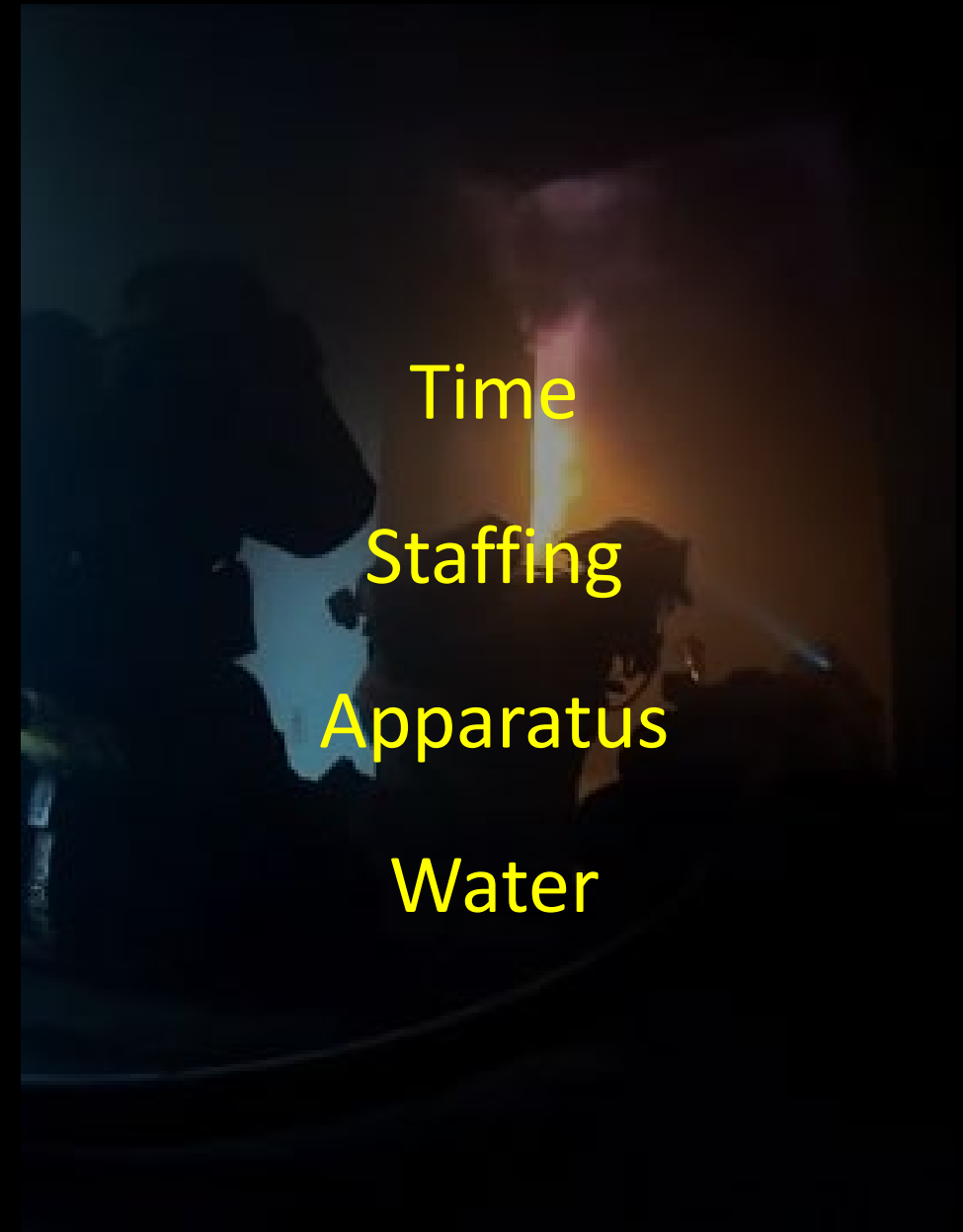
Minimum Fire
Damage

Minimum Fire
Control Damage

Minimum
Environmental Harm

Efficiency

- A level of performance that creates the greatest output (effectiveness) with the smallest input
- When operating an attack line for fire control, what are the inputs?



The Answer....

- Ideally an attack line will be both efficient and effective.
- An effective hoseline puts the water where it needs to be in the form that it needs to be in.
- Water may need to be applied to cool hot gases, surfaces, or both.

Solid Stream
Combination

Single Flow
Variable Flow
Automatic



Low Pressure
High Pressure
Ultra High Pressure



Straight Stream
Fog Pattern



Fire Suppression Research

11 Studies

Horizontal Ventilation
Vertical Ventilation
Positive Pressure Attack
Attic Fires
Exterior & Interior Attack-Water Mapping
Exterior & Interior Attack-Air Entrainment
Exterior & Interior Fire Attack – Full Scale
Coordinated Fire Attack – Apartments
Coordinated Fire Attack – Strip Malls

58 Recommendations Related to Use of Water for Fire Control

Distilled down to 11 Integrated Recommendations



Integrated Tactical Consideration

Consider all Effects of Fire Streams: Water does not push fire but can obstruct an exhaust opening and change the flow path. Air entrainment may change the flow path or influence gas flow in existing flow paths. Use air entrainment to your advantage.





Integrated Tactical Consideration

Coordination is Critical: Absent effective water application, adding air to a vent limited fire will increase HRR (and quickly if the fire has already self-vented). Coordination requires that ventilation occur immediately before, concurrent with, or after effective water application.



With limited staffing venting immediately before or concurrent with effective water application is extremely difficult!



Integrated Tactical Consideration

Post-Fire Ventilation is Essential: Post knockdown, rapid and effective ventilation is essential for the removal of smoke, enabling a quick return to tenable conditions throughout the structure. Hydraulic ventilation and positive pressure provide an effective means to increase the speed and effectiveness of ventilation operations.





Integrated Tactical Consideration

Time Matters: With all else being equal, the water application should be based more on time and less on the position the water is being applied from (interior or exterior).

When making a quick hit, use the fastest, path to the interior, limit the time between the last exterior water application and interior suppression.



Think, be skillful, and move with purpose!



Integrated Tactical Consideration

Use the Reach of your Stream: Reach of combination and solid stream nozzles considerably exceeds the largest typical dimensions of a typical residential compartment (solid, straight stream or narrow (30°) fog).





Integrated Tactical Consideration

Consider Your Attack Position: Select your attack position based on the fire's origin, access to the fire, potential for fire spread, effective water distribution (mapping), and speed of attack. Kill the source quickly!





Integrated Tactical Consideration

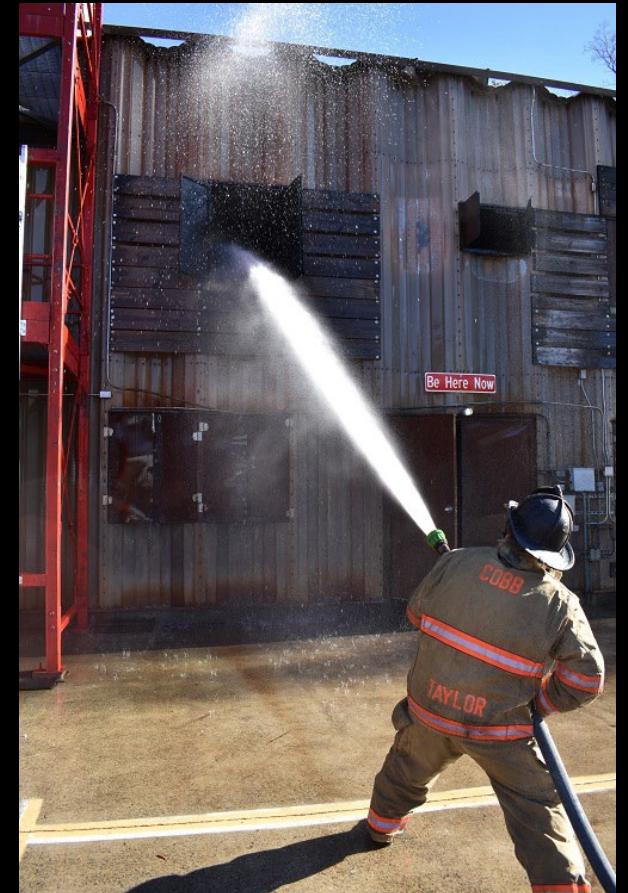
Apply Water Effectively: At the end of the day fire control always requires rapid application of sufficient water burning fuel. Consider building construction and configuration as well as fire stream characteristics in choosing water application methods!





Integrated Tactical Consideration

Use the Force: All fire streams entrain air! Understand the factors that influence air entrainment and use this phenomena as a force for good (rather than evil).





Integrated Tactical Consideration

Maximize the Effect of Water Application: If you have line of sight to the fire, put water on the burning fuel! Cool the gases and hot surfaces when approaching a shielded fire. Remember a post flashover compartment is different than one that is simply smoke logged.





Integrated Tactical Consideration

Focus on Effective Water Distribution (Mapping): If you can get water to where it needs to go, you don't need much. Bring a high enough flow rate and use what you need. Focus on effective distribution (put the water where it needs to go).





Integrated Tactical Consideration

Steam is Not the Enemy: Effective use of water for fire control reduces temperature and can contract hot gases to a greater extent than the expansion of steam created by suppression operations, making things better for both occupants and firefighters.



Integrated Tactical Consideration

Flow and Move vs Hit and Move: Flowing continuously is more effective in cooling than hit and move. However, while this approach may be effective when confronted with a large volume of flaming combustion, it may result in greater water use for the effect achieved when dealing with unignited smoke from a shielded fire.

Research making a “apples to apples” direct comparison of extinguishing methods is limited.

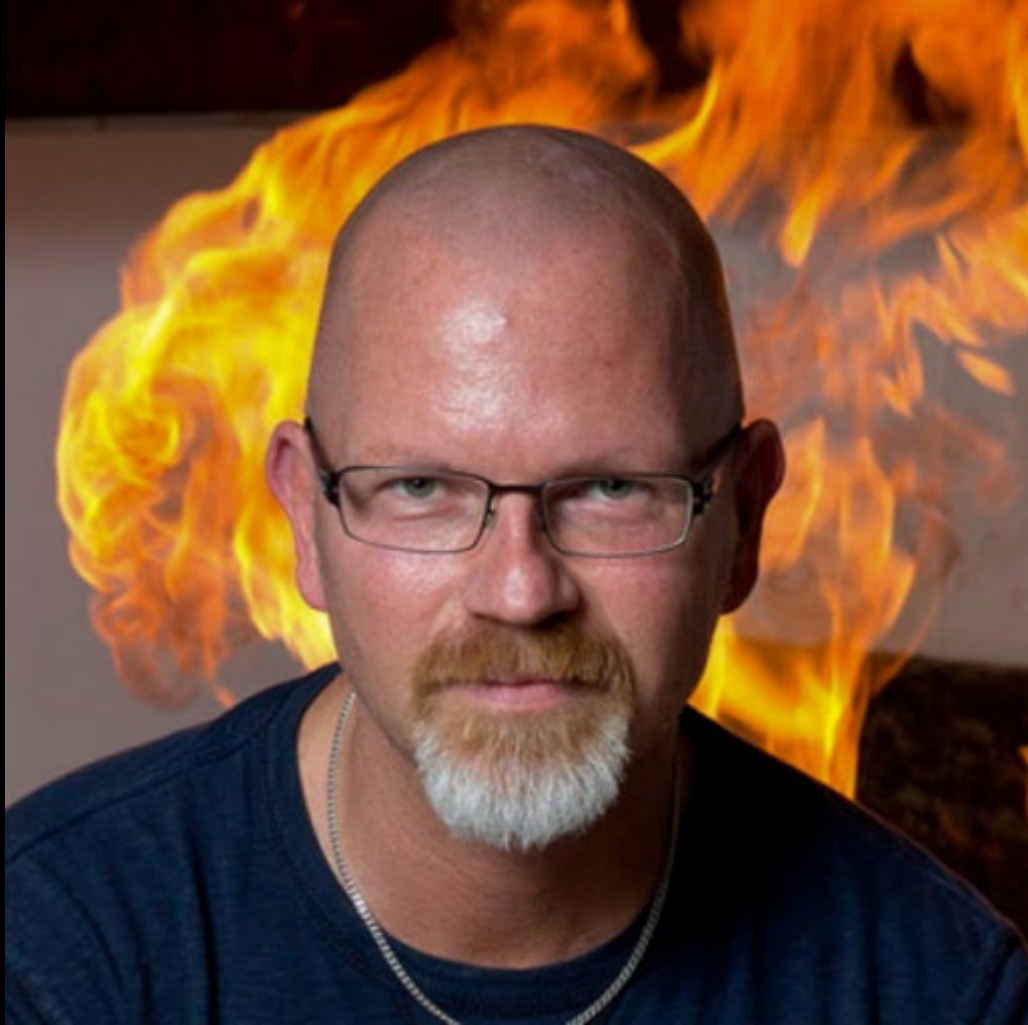
Normally when a new product or gadget comes out there is a sales pitch as to which "problems" the product solves. But usually, you can quickly identify a whole separate set of problems that a new product creates while trying to solve something else, thus earning it the title of "gadget".

With a standard solid stream, you must change your movement to fit the rough shape of the box you are trying to cool, which is typically fine for a knowledgeable firefighter on the nozzle.

In large residential spaces we have a twofold problem to address: the **fire gasses** both visibly burning and too rich to burn, and we have the **hot surfaces** that are driving the gas problem [likely the other way around]



Firefighter Jay Bonnifield



It's actually very simple: If there's fire, open the nozzle. If there's no fire, close the nozzle. If you need to cool hot gases, open the nozzle. If you don't need to cool hot gases anymore, close the nozzle. If fire is far away, use a straight stream. If fire is close [or if hot gases are close], use a wider stream.

Stefan Svensson, PhD



Seems like [a flow control ring is] an unnecessary complication to a tool that should, in my opinion, be a binary choice. Open or closed. The default position being Open.

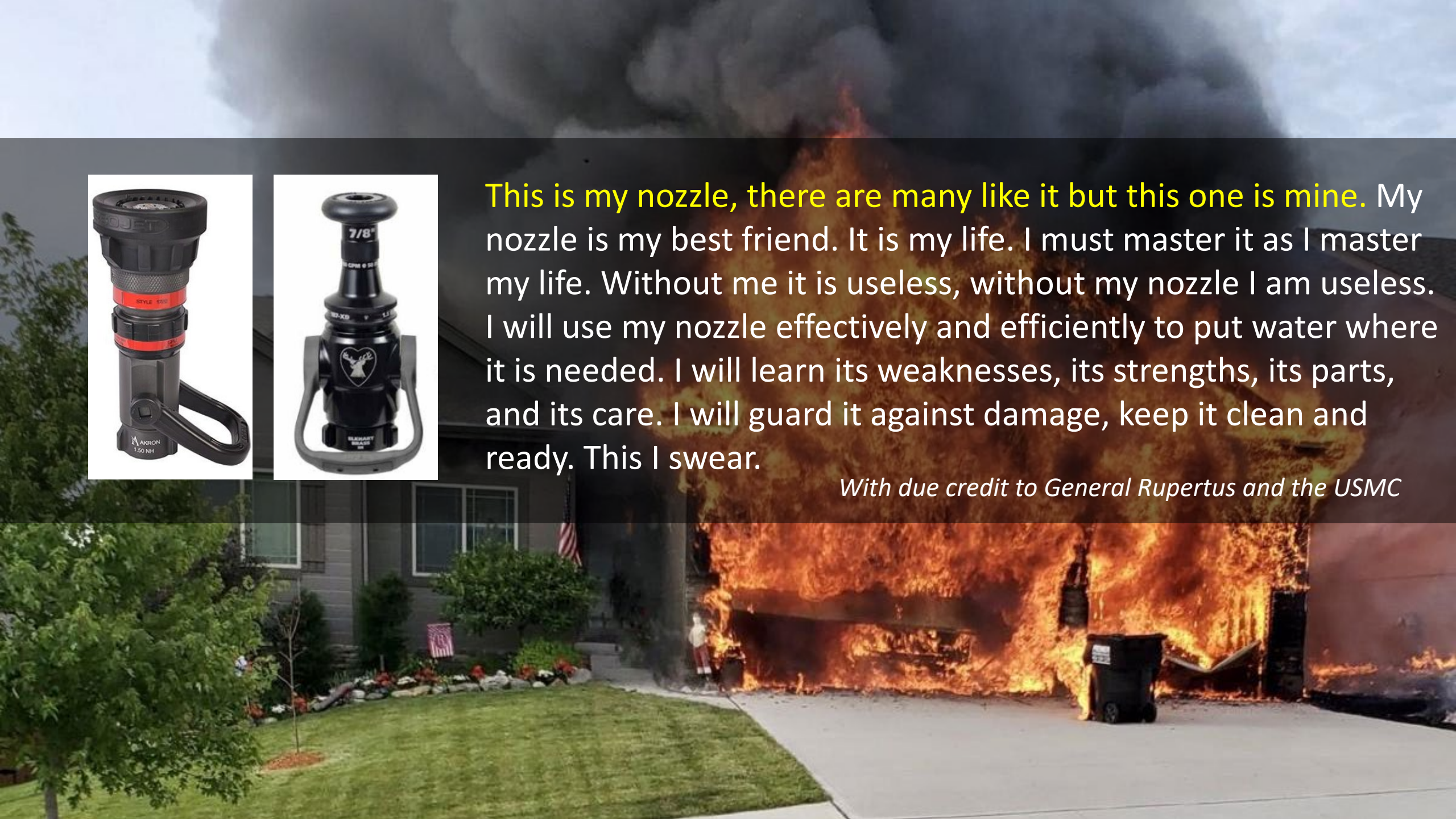
"Occam's Razor, put simply, states: "the simplest solution is almost always the best."

Deputy Chief Phil Jose (Ret.)
Seattle Fire Department



This is my nozzle, there are many like it but this one is mine. My nozzle is my best friend. It is my life. I must master it as I master my life. Without me it is useless, without my nozzle I am useless. I will use my nozzle effectively and efficiently to put water where it is needed. I will learn its weaknesses, its strengths, its parts, and its care. I will guard it against damage, keep it clean and ready. This I swear.

With due credit to General Rupertus and the USMC



Unified Theory of Fire Control



Beware Zealots (of any perspective)

You generally find what you look for

Firefighters are extinguishing fires all around the world

Physics is physics (and the fire does not recognize place)

Size, geometry, and configuration matter

Context is critical

Water distribution is critical and air entrainment is relevant

Hot gases and surfaces need to be cooled

Effectiveness is critical (and so is efficiency, but what does that look like?)







Darkwood
REX BILT

58

58

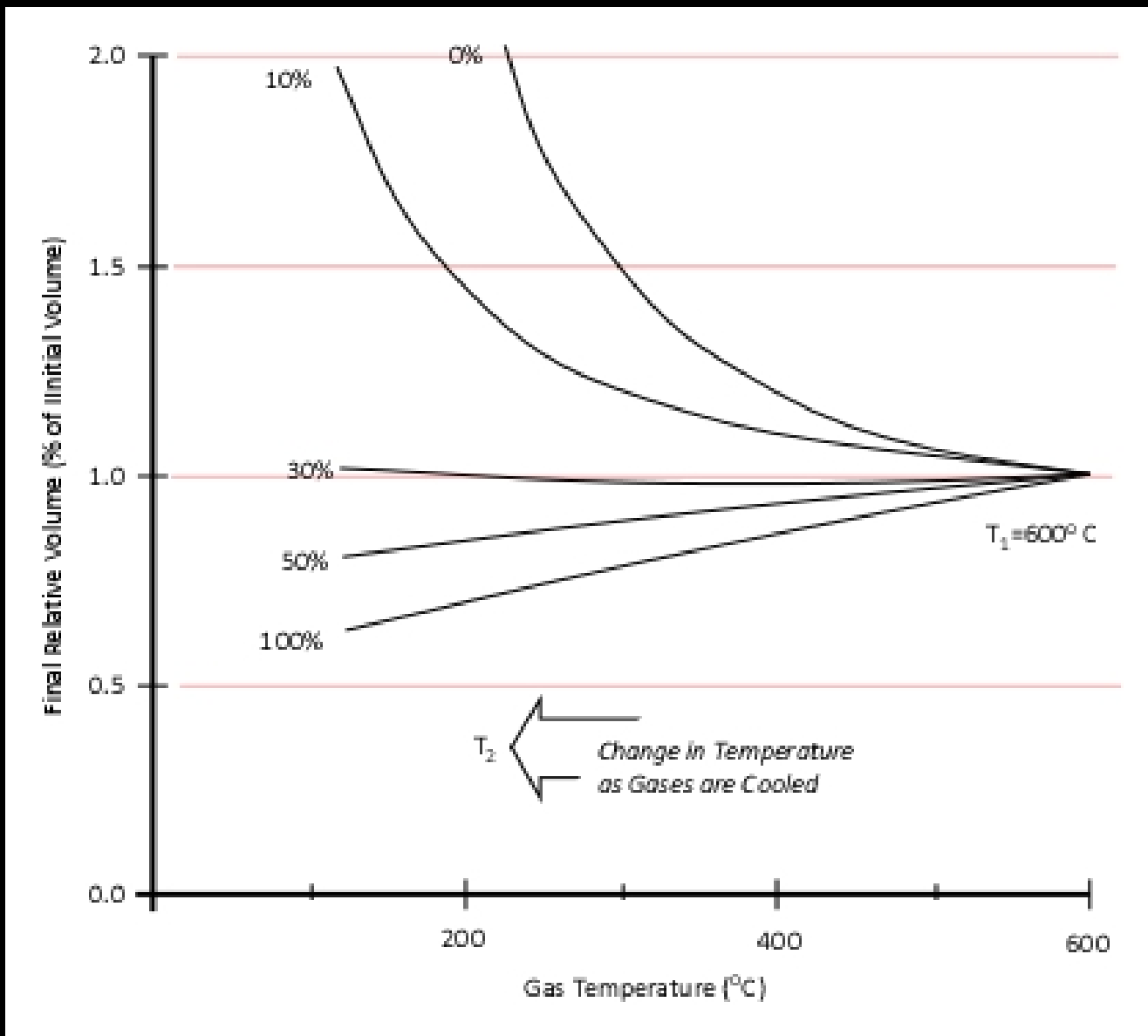
ES
F



Interesting questions...

- Why does UL FSRI (and the US Fire Service) focus so much on surface cooling?
- How can we explain gas contraction when straight or solid streams are used for surface cooling?





Note: Adapted from Water and Other Extinguishing Agents (p. 155), by Stefan Särndqvist, 2002, Karlstad, Sweden: Räddnings Verket. Copyright 2002 by Räddnings Verket

<https://www.palmbld.com/blog/water-damage-from-firefighting-hidden-costs>

$$\frac{V_1}{V_2} = \left(\frac{C_{p,g}(T_{u1} - T_{u2})}{b(C_{p,w}(373.15 - T_{w1}) + L_{Vw}) + C_{p,st}(T_{u2} - 373.15)} + 1 \right) \frac{T_2}{T_1}$$

Where:

$C_{p,g}$ =Specific heat capacity of fire gases/smoke (approximately the same as air, 33.2 J/mol K at 1000 K)

$C_{p,st}$ =Specific heat capacity of steam (41.2 J/mol K at 1000 K)

$C_{p,w}$ =Specific heat capacity of water (76.663 J/mol K at 215.15 K)

$L_{V,w}$ =Latent heat of vaporization of water 40,680 J/mol

T_u =Temperature of the upper layer (K)

T_w =Temperature of water (K)

n =Moles

Subscript of 1 refers to initial conditions

Subscript of 2 refers to conditions at (later) time 2



Stefan Särndqvist, PhD, FPE
AKA "Tall Stefan"

Note: Adapted from Water and Other Extinguishing Agents (p. 155), by Stefan Särndqvist, 2002, Karlstad, Sweden: Räddnings Verket. Copyright 2002 by Räddnings Verket

DATA

Fatalities

Injuries

Near Misses

Maydays

Rescues





Executive Summary

On February 20, 2026, one career firefighter was seriously injured after falling from a ladder while self-extricating from a boarding house fire. At approximately 10:45 hours, the public safety answering point (PSAP) received a 911 call reporting an electrical fire in the basement of a boarding house. At 10:46 hours, a box alarm assignment was dispatched for a high occupancy, electrical fire in the basement. At 10:48 hours, Engine 20-1 arrived on scene, and Lieutenant 20 reported smoke in the rear of the building. Utility 20 arrived on scene and extinguished the fire. Lieutenant 20 reported that the fire was knocked down and requested ventilation. Turbulent, heavy brown smoke came from the boarded-up windows on the first division near the basement door. At 10:53 hours, Captain 20 requested the second alarm. Ladder 24 arrived on scene and staged on Side Alpha. Ladder 24 firefighter (seriously injured) had a face-to-face with Captain 20, who assigned his crew to conduct a primary search. Ladder 24 firefighter entered the building as Ladder 24 driver/operator put on the rest of his personal protective equipment (PPE).

At 10:55 hours, the PSAP dispatched the second alarm assignment. Captain 20 walked down the alley on Side Bravo and reported active fire from windows on the first division. Ladder 24 firefighter and driver/operator completed searches on the second division as the hallway started filling with heavy white smoke. Ladder 24 firefighter and driver/operator split up, and each found multiple victims, who were directed to the stairs to self-extricate. At 10:59 hours, Chief 20 assumed command and designated Chief 20-1 as operations. Between 11:00 and 11:05 hours, there were multiple reports of entrapments with requests for ladders on Sides Alpha, Bravo, and Charlie. Ladder 24 firefighter instructed Ladder driver/operator went to the third division to continue searches. Ladder 24 firefighter instructed Ladder



Photo 1: View of structure, Side Bravo.
(Courtesy of the fire department)



Executive Summary

On December 29, 2025, four firefighters were seriously injured when a floor collapsed during interior operations in an abandoned residential structure fire. At 03:44 hours, the public safety answering point (PSAP) received a 911 call reporting a structure fire with visible smoke and flames. The caller stated they did not think anyone was inside. At 03:45 hours, the PSAP dispatched Pumper 4, 11, 14, 18, 19, Quint 2, Truck 14, Rescue 6, Medics 2, 18, Battalion 1, and Shift Commander for a low-rise alarm. Around 03:49 hours, Pumper 18, 14, and Medic 18 arrived on scene. Pumper 18 officer gave a size-up of a single-story wood frame with heavy fire showing from Sides Bravo and Charlie. He reported that Pumper 18 would stretch an attack line and directed the second arriving pumper to establish a water supply. As Pumper 18 firefighter stretched the attack line to the front door, the crew of Medic 18 and four members of Quint 2 joined them. As Pumper 18 officer was conducting a 360 size-up, he viewed Side Delta then returned to his crew. Quint 2 firefighter was conducting a 360 firefighter forced open the front door. Pumper 18 firefighter, Pumper 18 officer, and two Medic 18 firefighters made entry on the first floor. As the attack line entered the structure, Pumper 14 officer reported he had secured a second attack line at the garage with heavy fire showing. He extinguished heavy flames coming from the garage, significantly reducing fire conditions. Pumper 18 crew encountered heavy smoke conditions, no visibility, with no elevated heat. The crew of Quint 2 followed Pumper 18's crew and noticed flames coming through the floor. At 03:53 hours, the Shift Commander arrived on scene and assumed incident command (IC). Around the same time, there was a partial collapse of the living room floor. This caused Pumper 18 firefighter, Pumper 18 officer, and one Medic 18 firefighter to fall into the basement. Pumper 18 officer attempted to declare a Mayday. However, his message was unreadable. Medic 18 firefighter's radio was off. Once he turned the radio declared a Mayday identifying himself. The IC acknowledged the Mayday and made a request



Photo 1: View of Side Alpha of structure, post-fire.
(Courtesy of the fire department)



NIOSH Top 5

Causes of traumatic LODD on the fireground

1. Improper risk assessment.
2. Lack of incident command.
3. Lack of accountability.
4. Inadequate communications.
5. Lack of, or failure to, follow standard operating procedures (SOPs).

We need to know what these five things are. Really know!



1986-2026

Qualitative Analysis



Challenges to analysis of this data set.

- Inconsistent formatting of data within reports
- Inconsistent phrasing of contributing factors
- Inclusion of recommendations unrelated to the contributing factors
- Pre-2026, no examination of human factors



The First 5000 Key Findings

Shorter time to locate and remove trapped occupants results in increased survival rate.

45.15% of victims were found in bedrooms (not dependent on time of day).

16.42% of victims were found in the family room/living room.



Mayday, Mayday, Mayday!



Project Mayday (2015-2022)

Originally funded by a private foundation grant for one year to CERT(Command Emergency Response Training), Don and Bev Abbott, Glendale, Arizona.

The project provided information into the cause and response to “mayday” activities. This project will research each identified “mayday” submitted into three components through the use of surveys/responses.

1

Survey profiling the fire department (organization, number of stations, apparatus, personnel, run numbers, SOP's, training and any other related information.

62 Questions

2

Upon completion of Component 1, Component 2 will be sent that deals with the actual “mayday.” It request tactical worksheets, IAP, size-up information, statements and reports. We also request the audio radio traffic, dash cam or other video footage.

116 Questions

3

Upon completion of Component 2, Component 3 is sent requesting the fire department's handling of the post action response, critique, follow-up training, etc.

72 Questions



Project Mayday

Type of Mayday	Career	Volunteer
Lost/separated from hoseline	24%	19%
Falls into basements	20%	24%
Falls through/off roofs	17%	5%
Air problems	17%	14%
Entanglement	10%	14%
Gas explosions/collapse	6%	6%
Medical	-	16%
No communications	-	5%
Other	-	3%

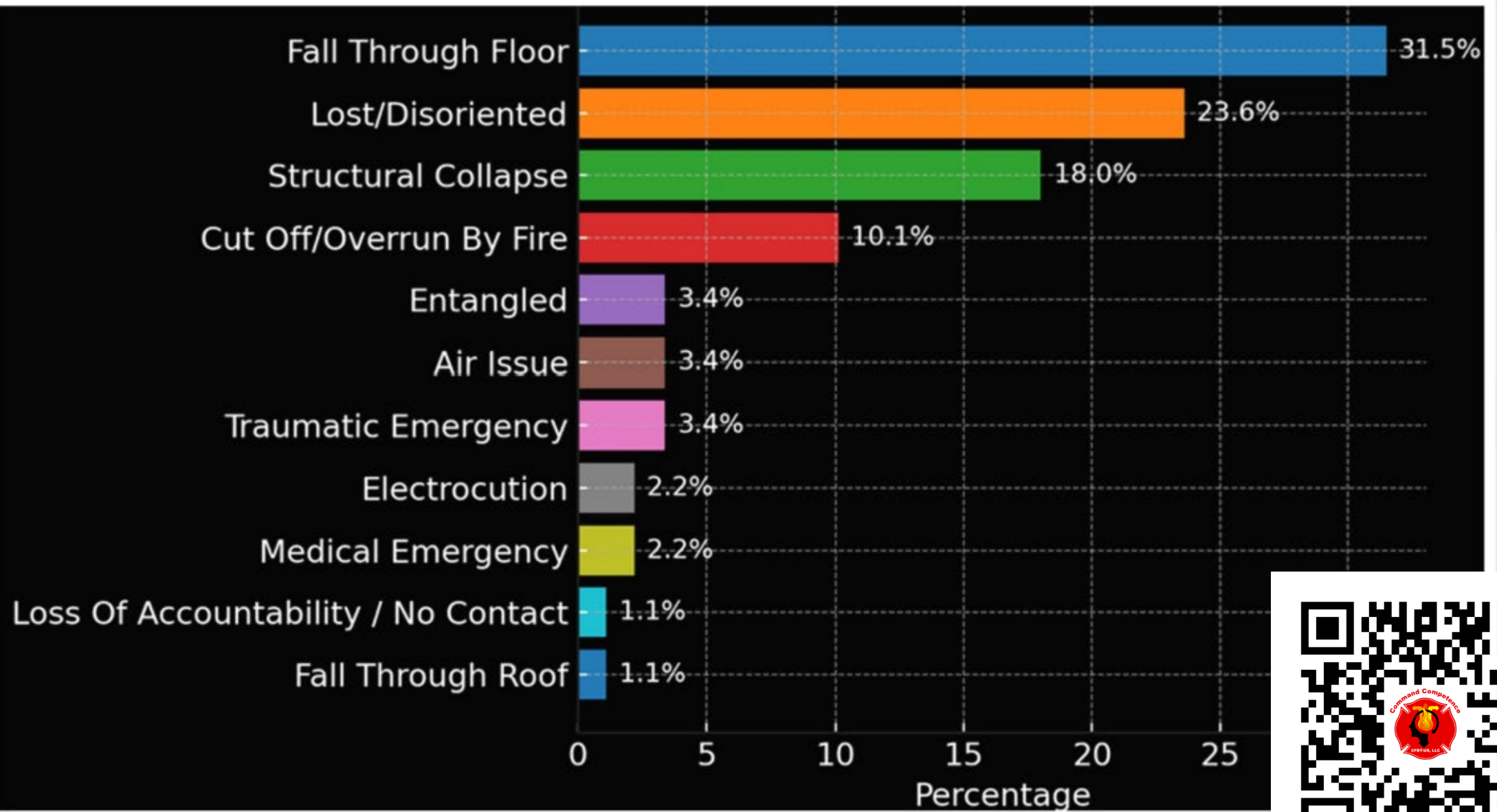
RESIZE ADD QRs TO REPORTS

Firefighter Mayday Survey (2025-Present)

The *Firefighter Mayday Survey* is a variation and continuation of *Project Mayday*, originally started by the late Don Abbott.

For the fire service to continuously improve, better understand firefighter experiences, and equip individuals with meaningful intelligence, it is imperative that we have an opportunity to objectively review incidents that have occurred.







NIST Technical Note 2365
NIST TN 2365

Understanding the Risk of Lithium-Ion Battery Fires

multi-source data analysis

Stanley W Gilbert
Hongqiang Fang
David T Butry
Wai Cheong Tam
Michelle Donnelly
Juan F Fung



This publication is available free of charge from:
<https://doi.org/10.6028/NIST.TN.2365>

NIST NATIONAL INSTITUTE OF
STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE





NIST



Research With the Fire Service



- Wind Driven Fires
- Engineered Lumber
- Horizontal Ventilation
- Vertical Ventilation
- O'Hare Airport
- Governors Island, NY
- Spartanburg, SC
- Attic Fires
- Positive Pressure Ventilation
- Basement Fires
- Interior and Exterior Streams
- Coordinated Fire Attack
- Cardiovascular and Chemical Risks
- Fire Service Training Environment
- Size-Up/Search and Rescue
- Fire Patterns & Fire Investigation



NIST









UL FSRI Resources

- Technical Reports
- Fire Service Reports
- On-Line Training Programs
- Video (YouTube & Vimeo)

Technical Reports

Analysis of Search and Rescue Tactics in Single-Story Single-Family Homes: Part IV

Research Report (Version 1.0)

Rebekah Schrader
Keith Stakes
Ryan Chaffer

Fire Safety Research Institute
UL Research Institutes
Columbia, MD 21045

March 11, 2026

This publication is available free of charge from:
<https://doi.org/10.60752/102376.31589659>



Video



On-Line Training



UL FSRI Incident Near Miss Investigations

- La Grange, Georgia – Residential Fire
- Cobb County, Georgia – Apartment Fire
- Surprise, Arizona– Li Battery ESS Explosion
- Fairfax County, Virginia – Live Fire Training
- Chula Vista, California – Warehouse Fire

Technical Reports

Fairfax County Fire and Rescue Department Live Fire Training Experiments

Daniel Madrzykowski
Rebekah Schrader
Ryan Chaffner
Keith Stakes

Fire Safety Research Institute
UL Research Institutes
Columbia, MD 21045

October 7, 2025

This publication is available free of charge from:
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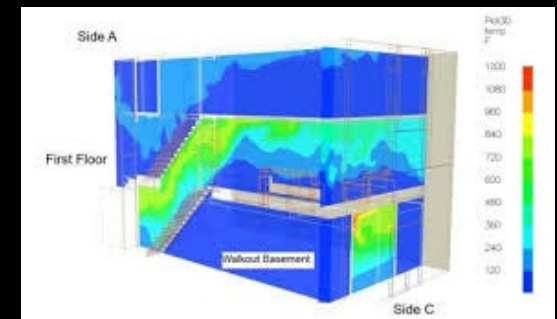
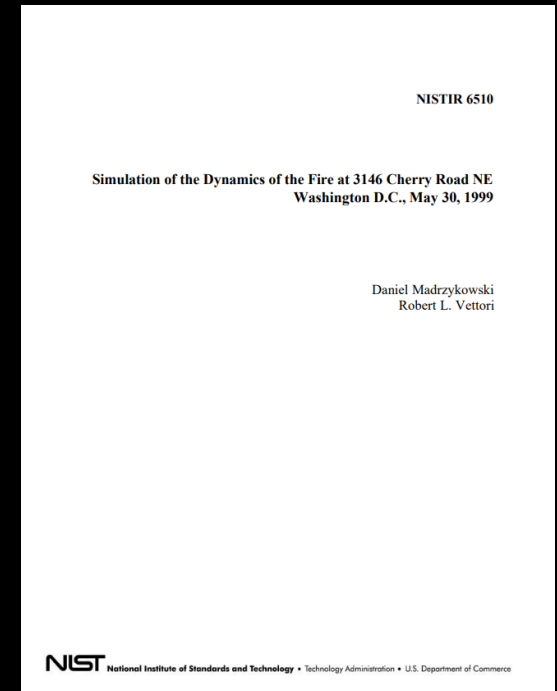


Technical Reports

NIST Incident Investigations

- Cherry Road, Washington DC – Townhouse Fire
- Keokuk, Iowa – Residential Fire
- Houston, Texas – Wind Driven Residential Fire
- Chicago, Illinois – Residential Fire
- Charleston, South Carolina – Commercial Fire

Technical Reports



WHAT IS A TACTICAL CONSIDERATION?

Thoughts from FSRI Technical Panel Members



NFPA®

1700

Guide for
Structural Firefighting

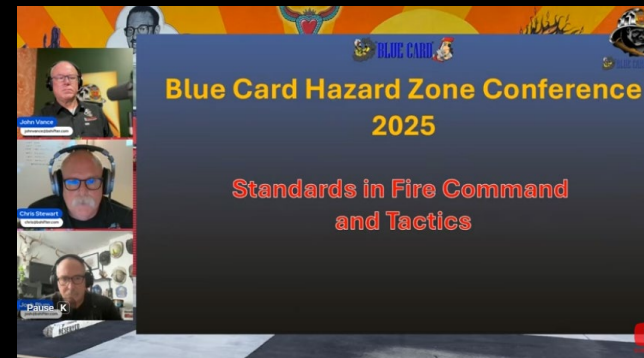
2026



Origin of the Guide for Structural Firefighting

- Scope: Structural firefighting strategies and tactics supported by science-based research.
- Purpose: Provide guidance for development of policies procedures and guidelines for structural firefighting.

Webinar: NFPA 1700: Guide to Structural Firefighting—Why Does It Matter to an IC?



<https://bit.ly/4e8vctb>

Caveat

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Use of this guide is intended to provide a platform for comparison with international firefighting practices and critical thinking about the content of the guide. This guide or on-line access to all NFPA standards and guides may be purchased at www.nfpa.org.

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Chapter 4	Background
Chapter 5	Fundamentals of Fire Science
Chapter 6	Fire Dynamics in Structures
Chapter 7	Building Construction and Structural Considerations
Chapter 8	Firefighting Protective Clothing and Equipment Characteristics and Limitations

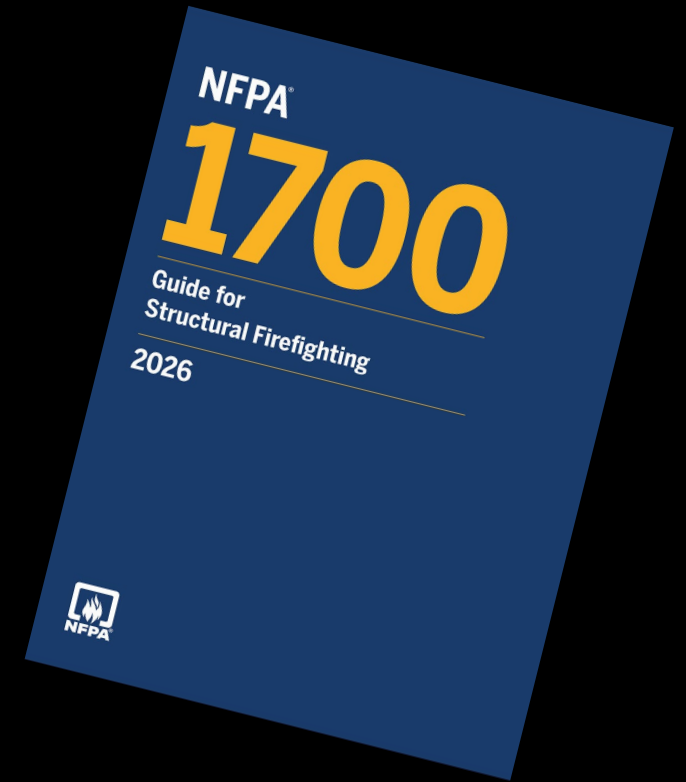


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Chapter 11	Exposure and Hygiene Considerations
Chapter 12	Fire Specific Tactical Considerations
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Chapter 14	Implementing NFPA 1700

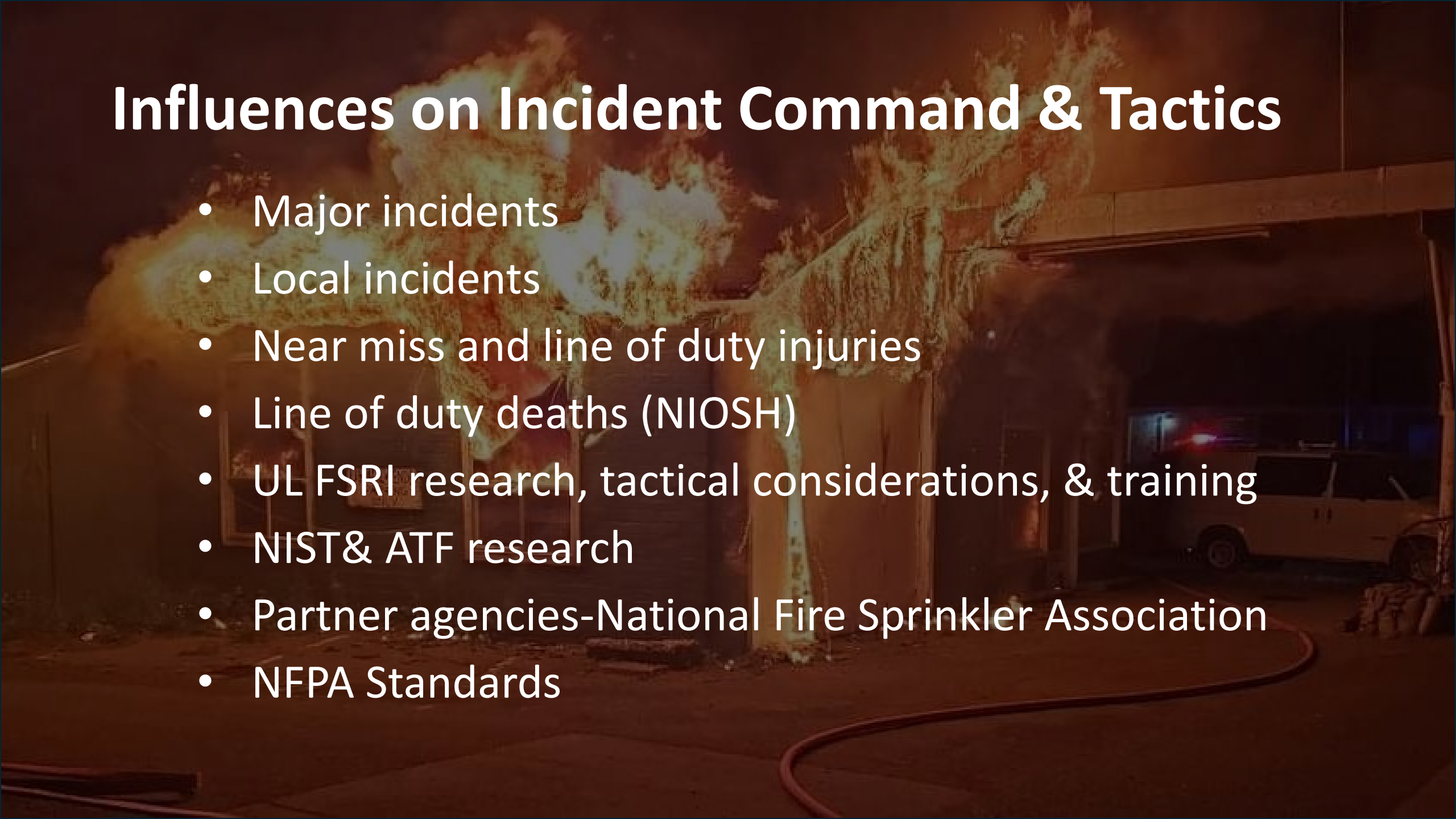


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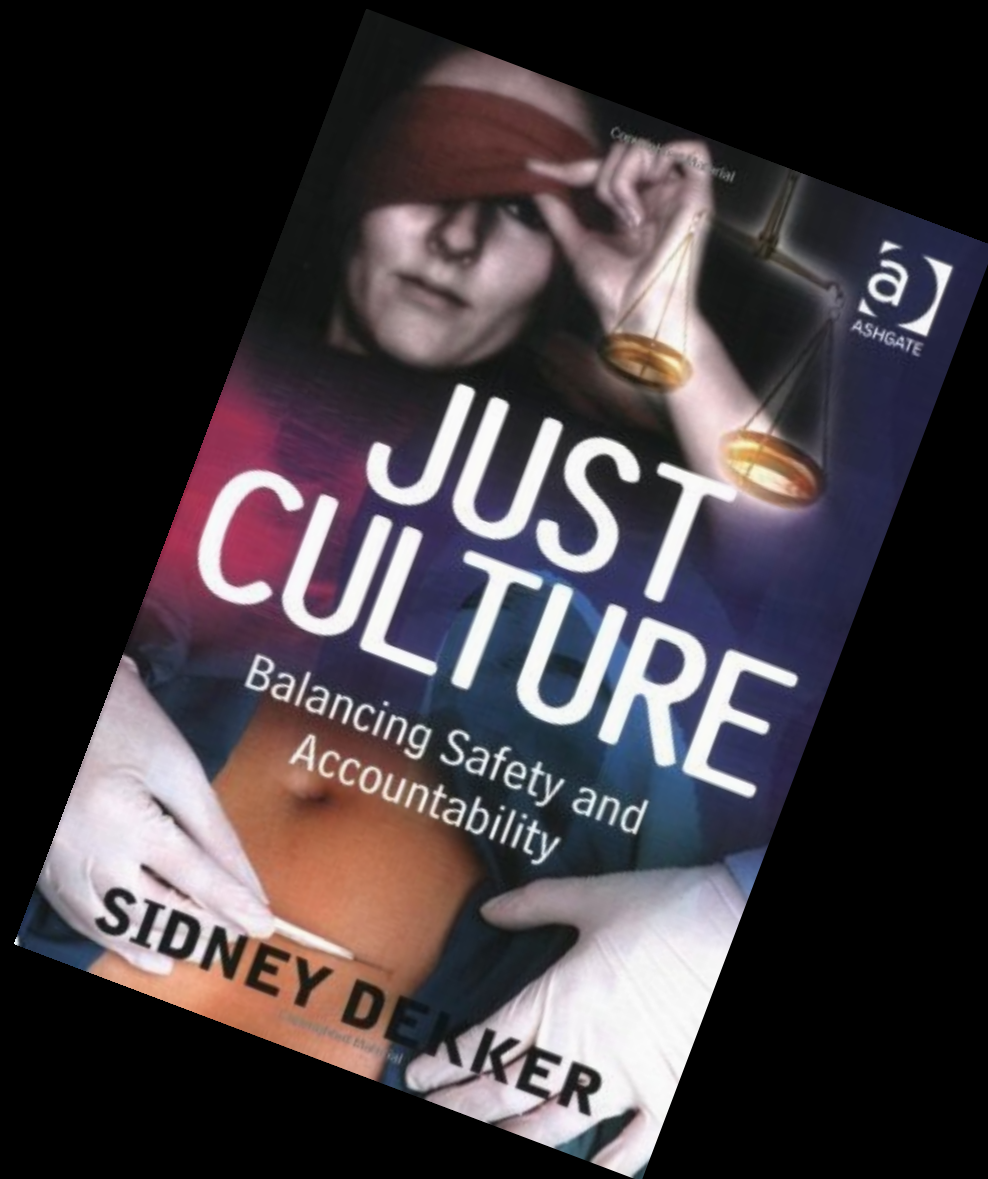
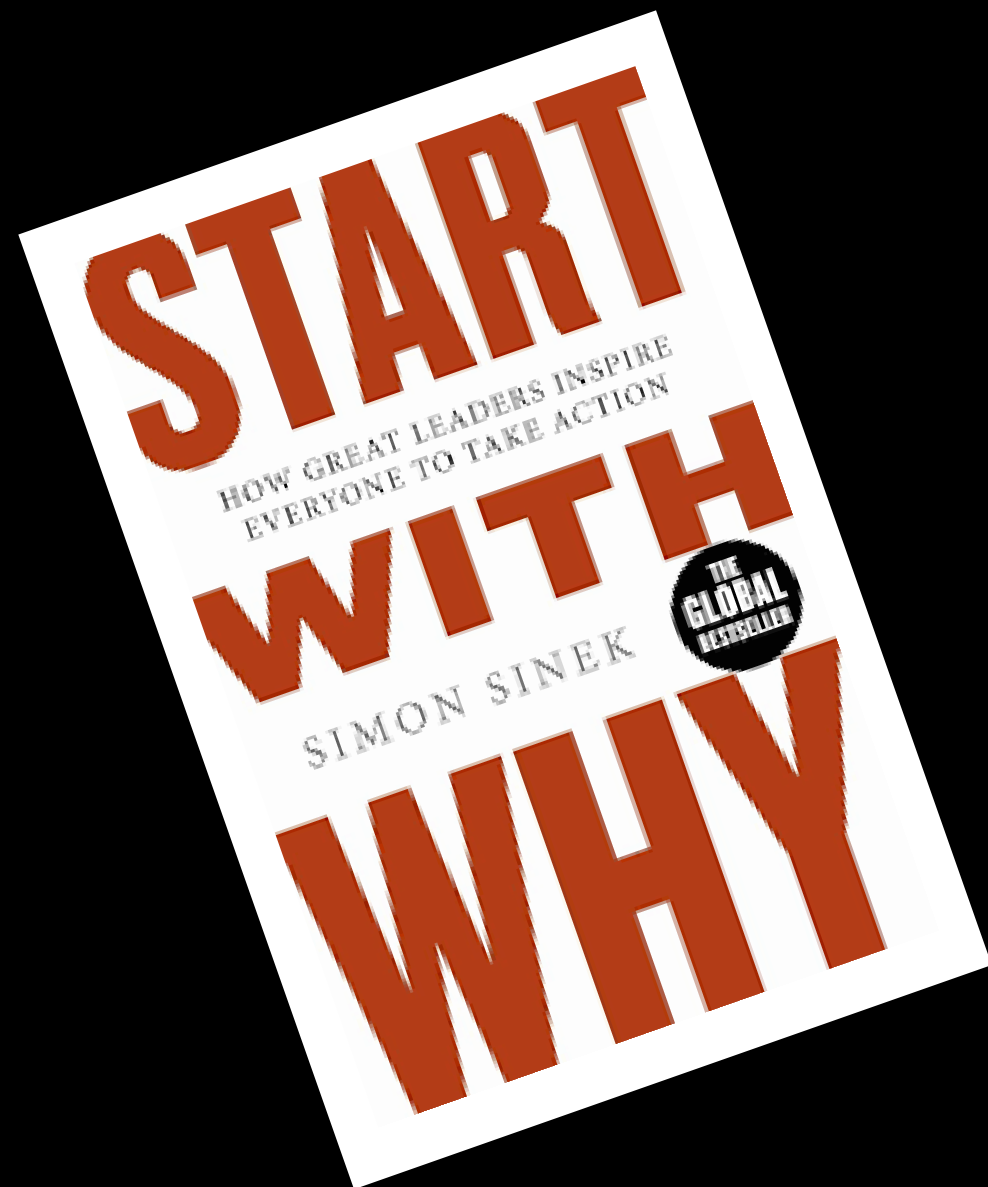
Annex A	Explanatory Material
Annex B	Template Standard Operating Procedures/Guidelines
Annex C	National Fallen Firefighters Foundation (NFFF)
Annex D	Informational References



Influences on Incident Command & Tactics

A photograph of a building on fire at night. The fire is large and intense, with bright orange and yellow flames rising from the structure. A fire truck is visible in the background, and a fire hose is laid out on the ground in the foreground. The scene is dark, with the fire providing the primary light source.

- Major incidents
- Local incidents
- Near miss and line of duty injuries
- Line of duty deaths (NIOSH)
- UL FSRI research, tactical considerations, & training
- NIST& ATF research
- Partner agencies-National Fire Sprinkler Association
- NFPA Standards



The Golden Circle

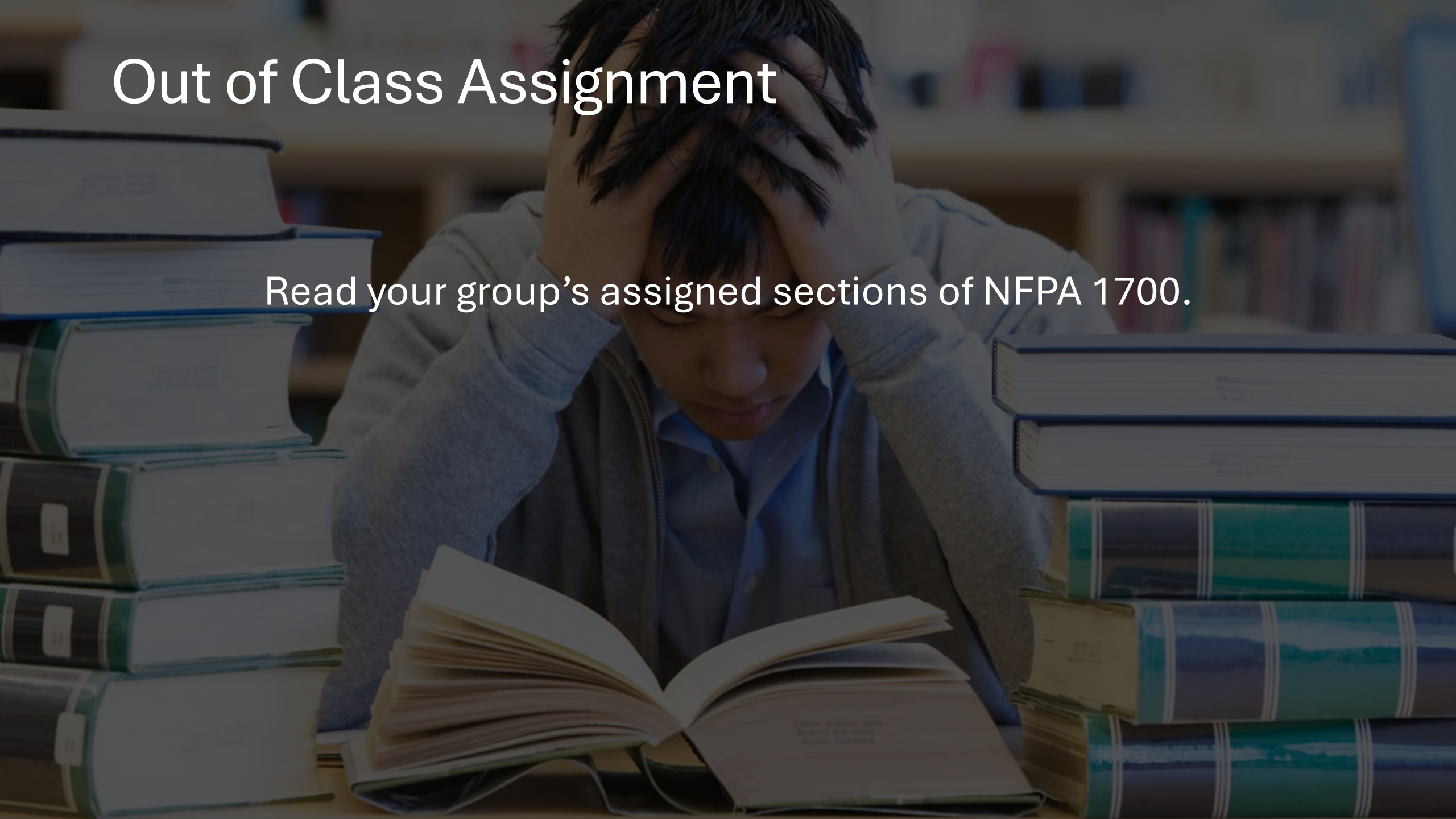


- Why do you do what you do?
- How do you do it?
- What do you do?

Methodology

1. Read assigned sections of the guide.
2. Discuss the assigned sections with member of your work group.
3. Present a brief overview of your assigned sections to the class.
4. Lead a discussion of what makes sense and what does not and where the guide is applicable in a broader context.
5. Identify recommendations from your work group and the class to ensure that the guide makes sense and is applicable in a broader context

Out of Class Assignment

A student with dark hair, wearing a grey hoodie over a blue shirt, is sitting at a desk. They have their hands pressed against their temples, looking down with a stressed expression at an open book in front of them. The desk is cluttered with several large stacks of textbooks on both sides. The background is a blurred library or study hall with bookshelves.

Read your group's assigned sections of NFPA 1700.



Questions?

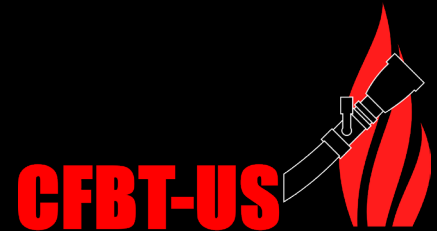
Ed Hartin

Command Competence, CFBT-US LLC

ed.hartin@cfbt-us.com

(503) 793-1296

<https://www.commandcompetence.com>



Strategy, Tactics, and Decision Making for Structural Firefighting



Sensemaking

Practice

Naturalistic
Decision Making

Situational
Awareness

Research

Capabilitie &
Limitations

Day 2

Resources

Fire Dynamics

Strategy

Fire Control

Anti-Ventilation

Ventilation

Search

Tactics



NFPA®

1700

Guide for
Structural Fire Fighting

2021



NFPA®

1561

Standard on
Emergency Services
Incident Management System
and Command Safety

2020



NFPA®

1400

Standard on Fire Service Training

2026

Includes

NFPA 1402 | NFPA 1403 | NFPA 1404 | NFPA 1407
NFPA 1408 | NFPA 1410 | NFPA 1451



A large puzzle is shown on a dark grey surface. The puzzle pieces are a mix of brown and tan colors. One central piece is missing, revealing a bright orange and yellow fire. The puzzle pieces are arranged in a way that suggests a house is on fire.

You are responding to a **House Fire**

*What are the first things that come to your mind?
What decisions will you need to make?*



Critical Questions



- How do fire officers make sense of an incident before they arrive?
- What cues do we notice first, and which do we miss?
- How do early assumptions shape our initial strategy and risk tolerance?
- When (and how) do we recognize that our initial understanding is wrong?

Experience & Expertise

How many fires?

What was your role?

What did you learn?

How much do you remember?

Can you apply it in context?

Experts demonstrate superior performance on a specified set of representative tasks for a domain.

How much experience do you really have?

Do you have expertise as a fireground commander?



Types of Knowledge

- **Declarative Knowledge:** Knowing what.
- **Procedural Knowledge:** Knowing how.
- **Tacit Knowledge:** A web of intuitive and experiential insights.

Recognizing the pattern of changing conditions and anticipating potential for flashover is an application of tacit knowledge (rather than a thoughtful analysis of the reasons for increasing smoke velocity, lowering neutral plane, and darkening smoke color).



Routine vs Adaptive Expertise

Adaptive expertise requires depth of knowledge.



- Personal experience.
- Directed experience (apprenticeship).
- Manufactured experience (simulation).
- Vicarious experience (stories).



Sensemaking

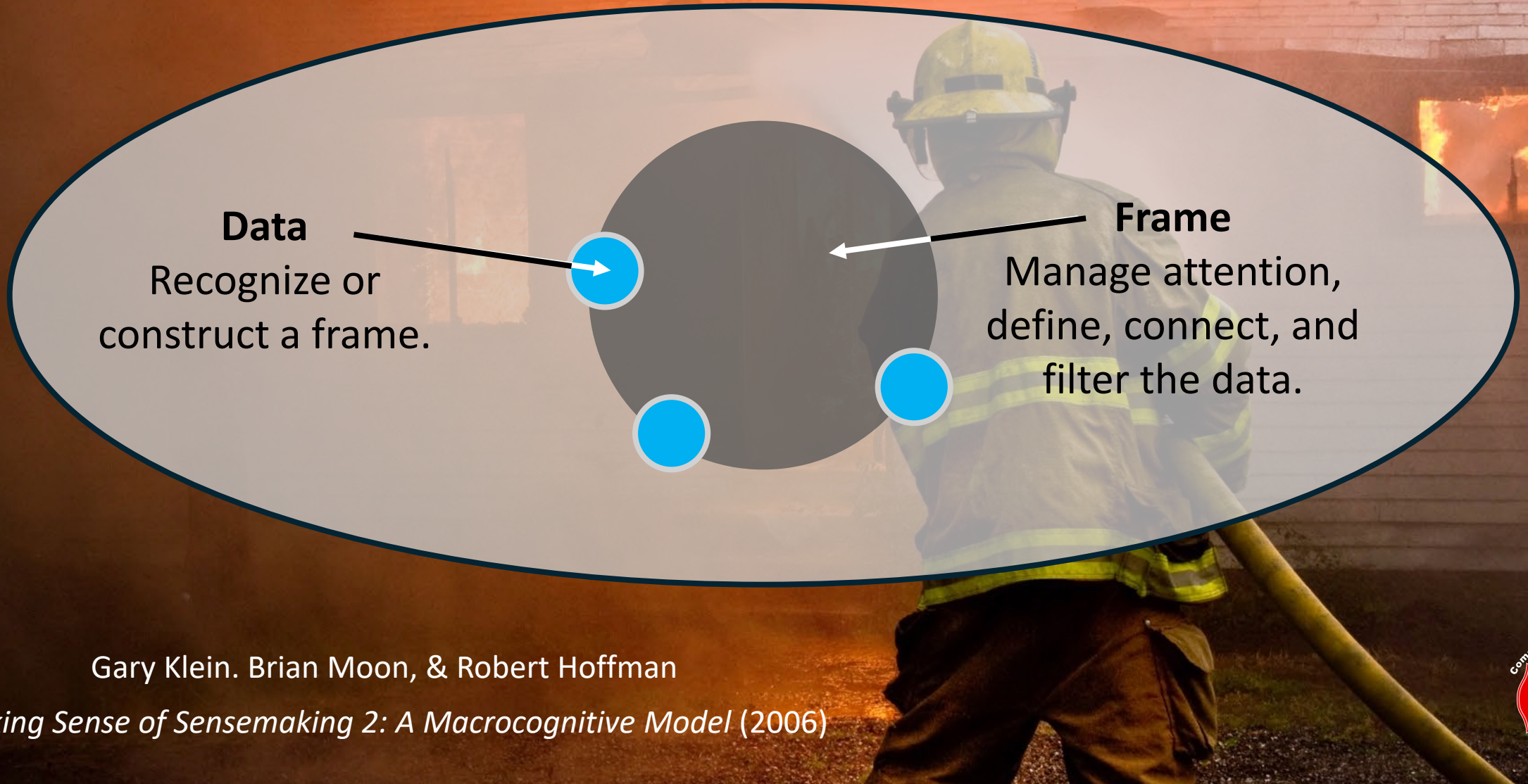


- The concept of sensemaking is well named because, literally it means the making of sense (Karl Weick)
- Sensemaking is the way that people interpret and give meaning to their experiences.
- It is an effort to answer the questions “what’s going on?” and “what should I do”?

Responding to and operating at fires, fire officers make sense with limited, ambiguous, and dynamic information.



Sense Making-Data Frame Theory



Gary Klein. Brian Moon, & Robert Hoffman

Making Sense of Sensemaking 2: A Macrocognitive Model (2006)





Multiple Frames





Anticipation and Planning

- Is this situation typical?
- What do I expect to find?
- What cues are relevant in this situation?
- What goals are plausible?
- What actions might I need to take?

More on this in a bit...

Naturalistic Decision-Making



- A field of study examining how people make decisions in real-world situations.
- Focuses on how people use their experience and intuition to make decisions in complex, uncertain, and high-stakes environments.

Early NDM work focused on fireground command decision-making

Expert and Novice Fireground Command Decisions (Calderwood, Crandall, & Klein, 1987)

Rapid Decision making on the fireground (Klein, Calderwood, & Clinton-Cirocco, 1988)



What is a Decision?

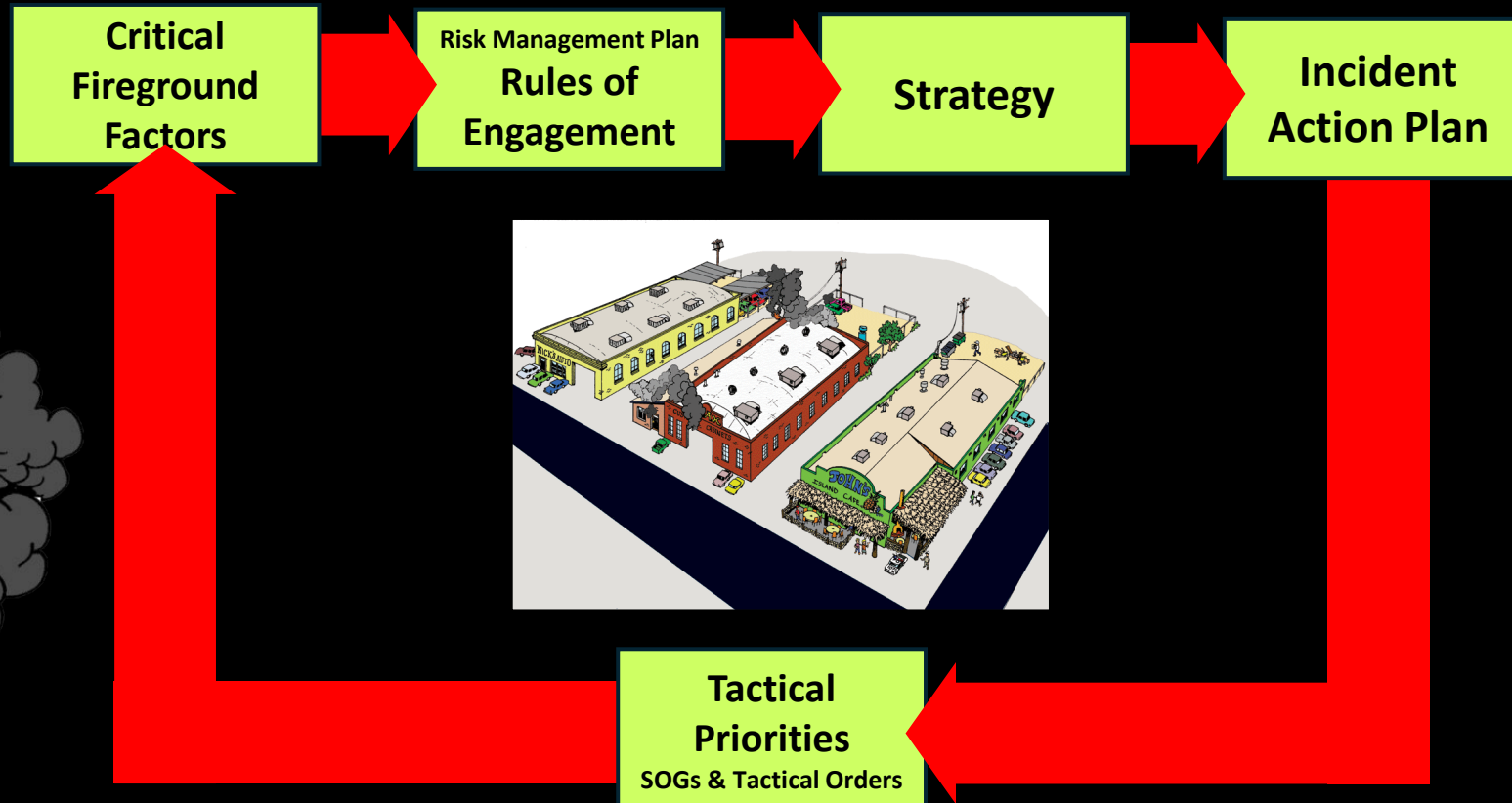


- Comparing two or more options and making a choice.
- Choosing without comparison.

Novices vs. Experts



Strategic Decision-Making Model



Declarative and Process (But Not Tacit) Knowledge



Critical Factors

Fixed Factors

- Building
- Occupancy
- Arrangement

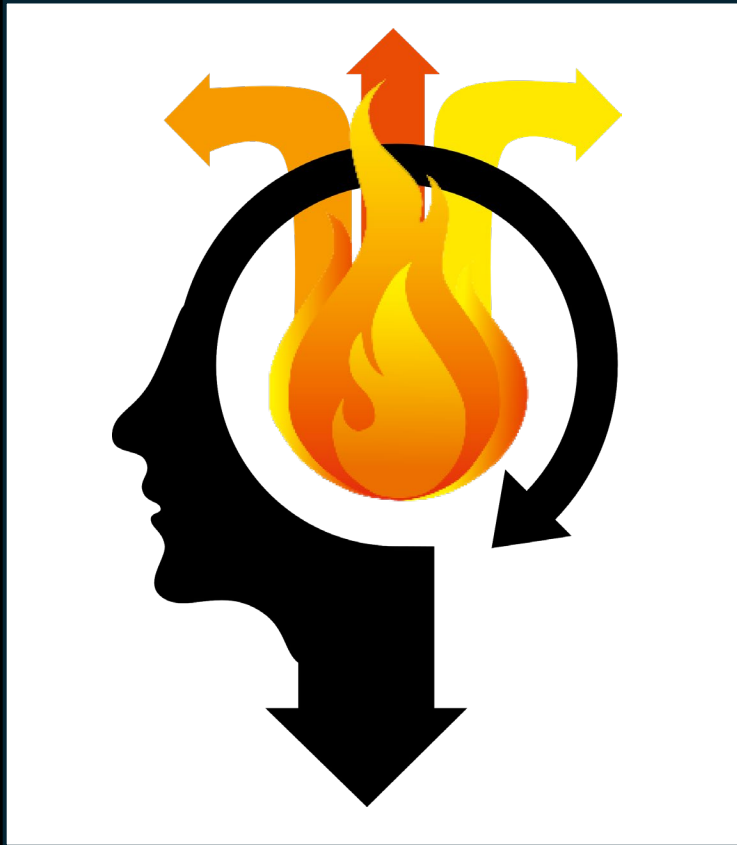
Variable Factors

- Fire
- Life Hazard
- Impact of Action
- Special Circumstances
- Resources

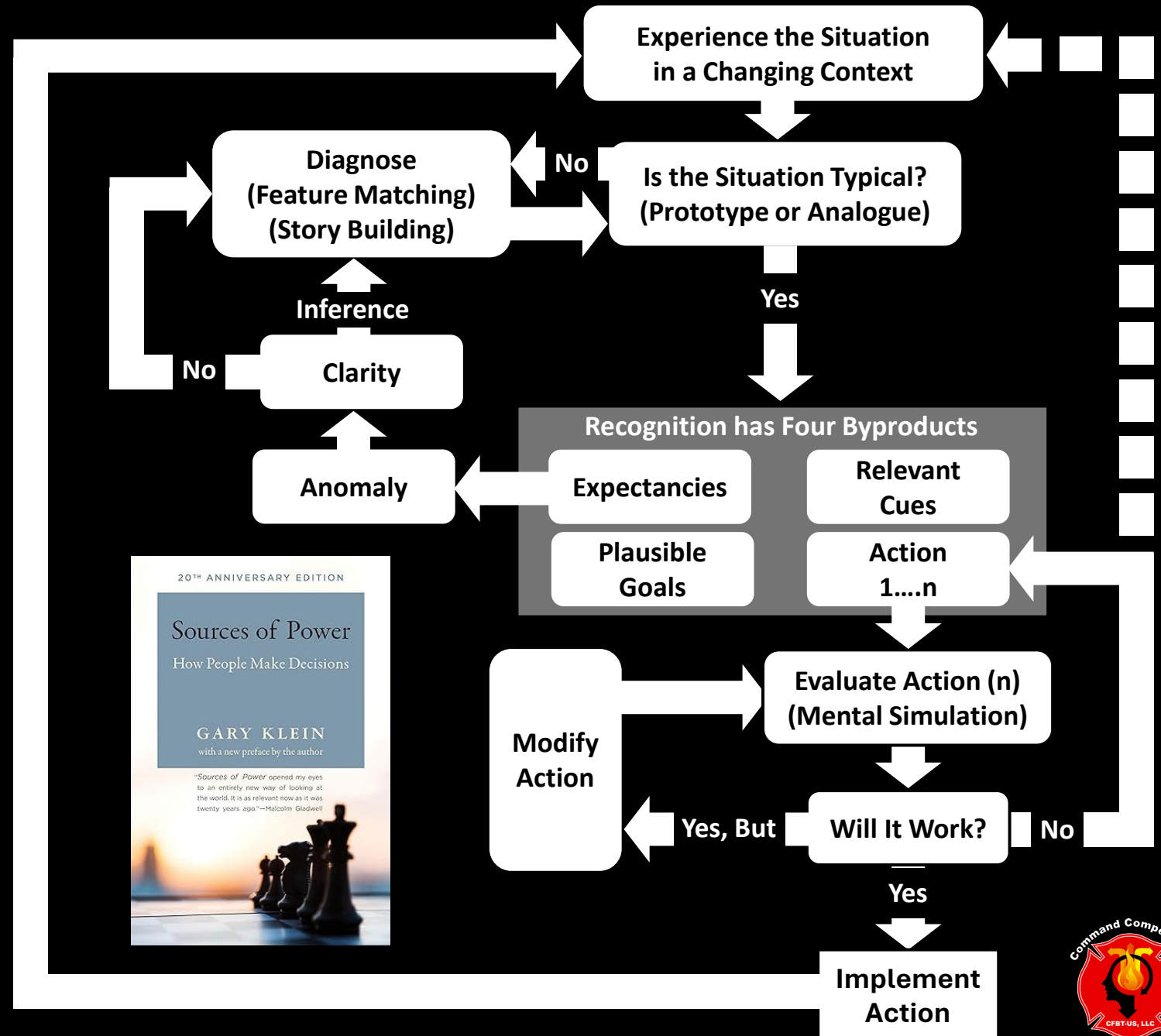
There are a multitude of fireground factors that may be critical, but attempting to think about all of them quickly overloads your working memory!



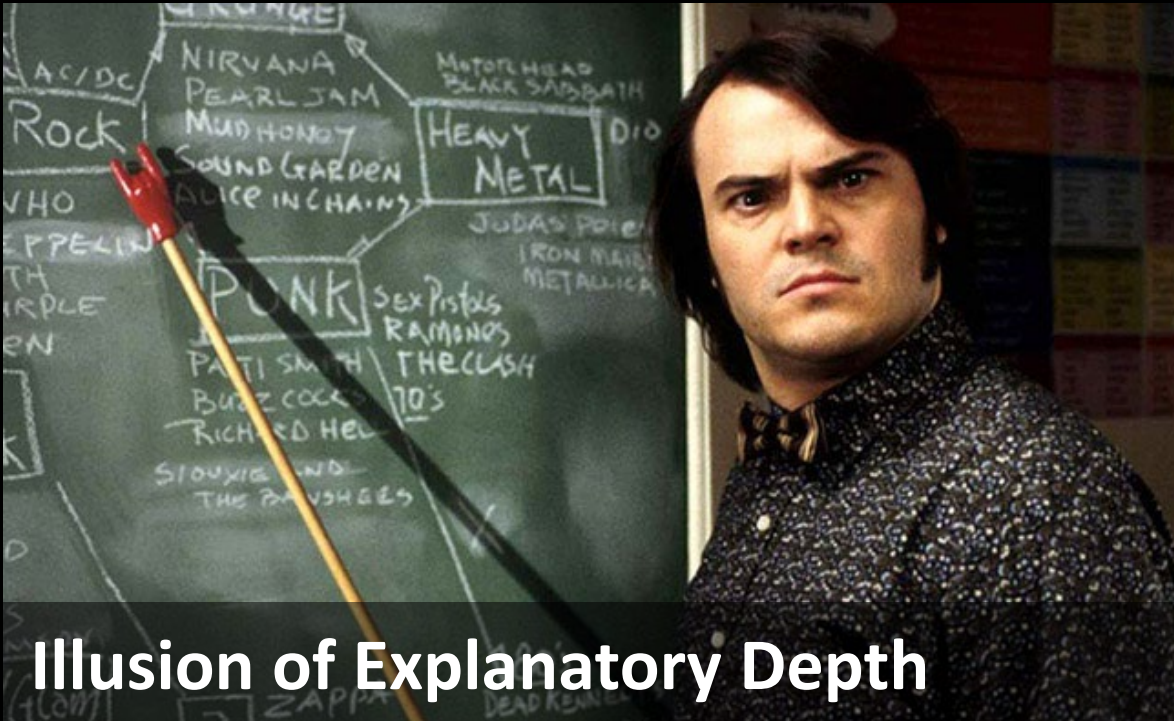
RPD is a Cyclical Process



Learning about the model explains how and why but does not make you a better decision-maker!



Challenges to Effective Incident Command



You probably **don't** know as much as **you think** you do.

- What is the impact on sensemaking and decision making on the fireground?
- What can we do about it?

We can't implement effective tactics when we don't understand the fire environment and the effect of our operations.

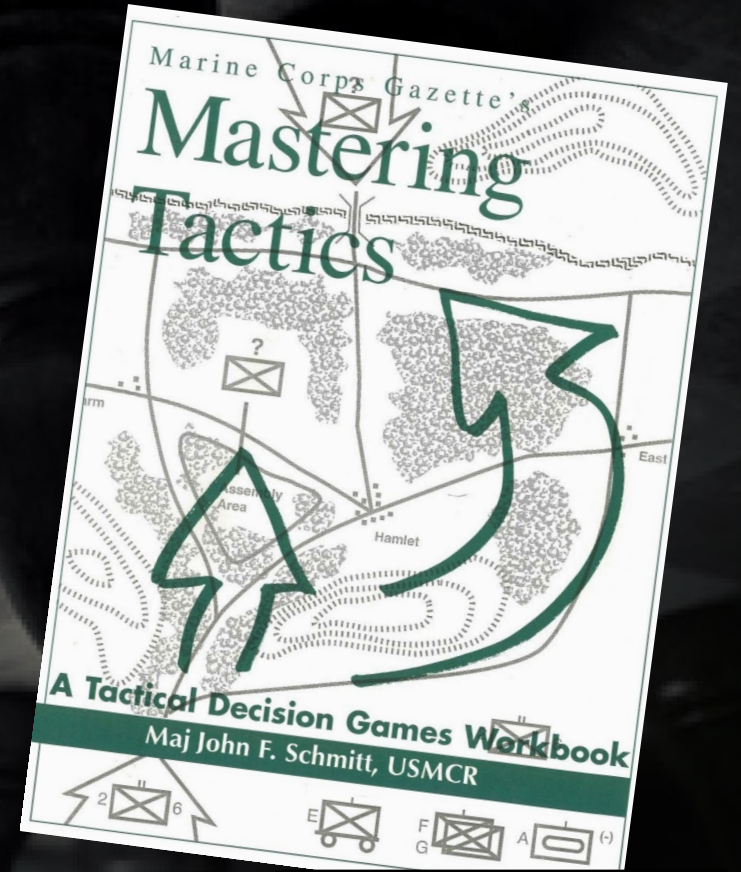


ICs Require

- An effective mindset, attitude, and aptitude.
- Well developed job knowledge and experience.
- Effective incident management skills.
- Leadership rooted in credibility and competence.

Developing Expertise

- **Practice:** Concentrate deeply on applying a variety of strategies to improve performance incrementally.
- **Feedback:** Seek feedback after completing tasks to assess accuracy and understand outcomes.
- **Analysis:** Study past performance, your own and experts', to analyze what worked, why, and areas for improvement.
- **Modify:** Adjust tasks, problems, or strategies in subsequent practice sessions based on your analysis and feedback to enhance skill development.



Pre-Arrival Thinking

Why study station officers' pre-arrival thinking?



The first arriving station officer establishes:

- Initial frame
- Strategy risk posture
- Tempo of the incident

Yet most training focuses on:

- Command mechanics
- Strategy & tactics
- Not cognition

Research Design

Participants

Station officers who were the IC at a recent working structure fire.

Methods

- Cognitive interviews.
- Focus on pre-arrival and early command of incident operations.

Focus

- Anticipation.
- Cue Selection.
- Framing & frame handling.
- Pre-arrival anticipation and planning.
- Early incident action plan.



Preliminary Observations



- Frame of reference is identified based on a limited number of cues.
- Sometimes, the initial frame does not match later information or what is found on arrival.
- The initial frame can help identify anomalies (something does not match).

What is Size-Up?



Consider Fixed & Manage Variable Factors

Fixed Factors

- Building
- Occupancy
- Arrangement

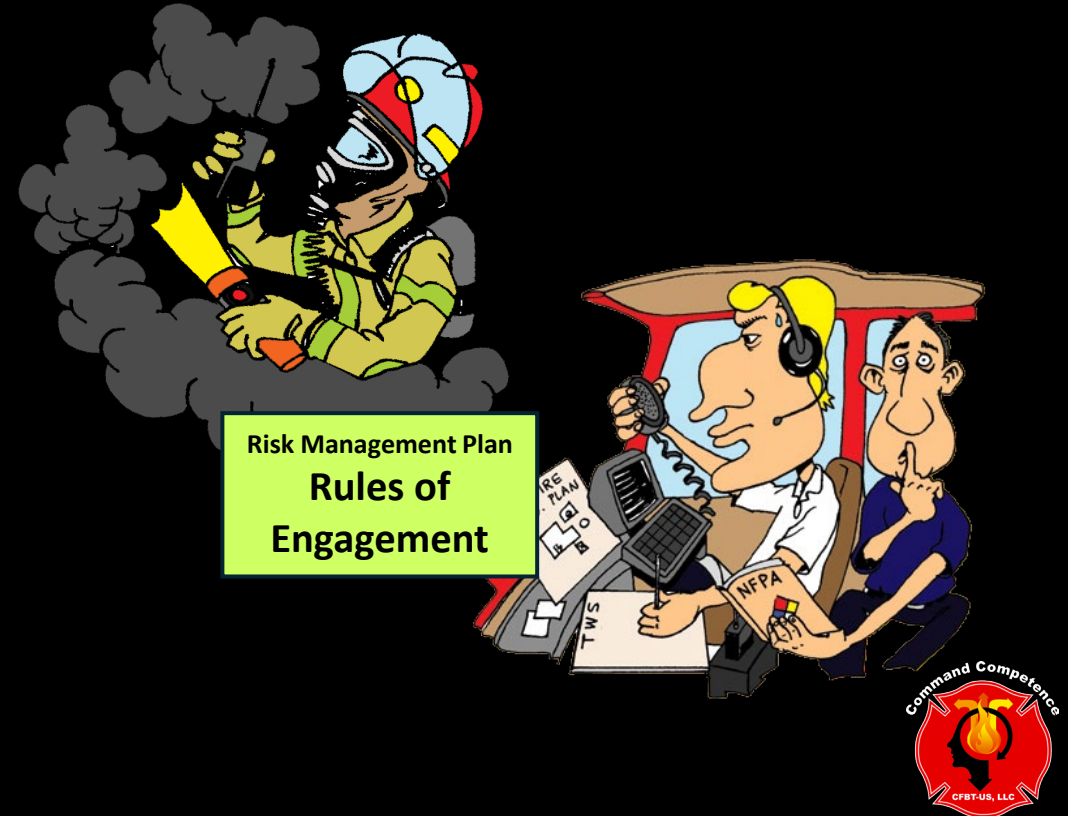
Variable Factors

- Fire
- Life Hazard
- Resources
- Action
- Special Circumstances



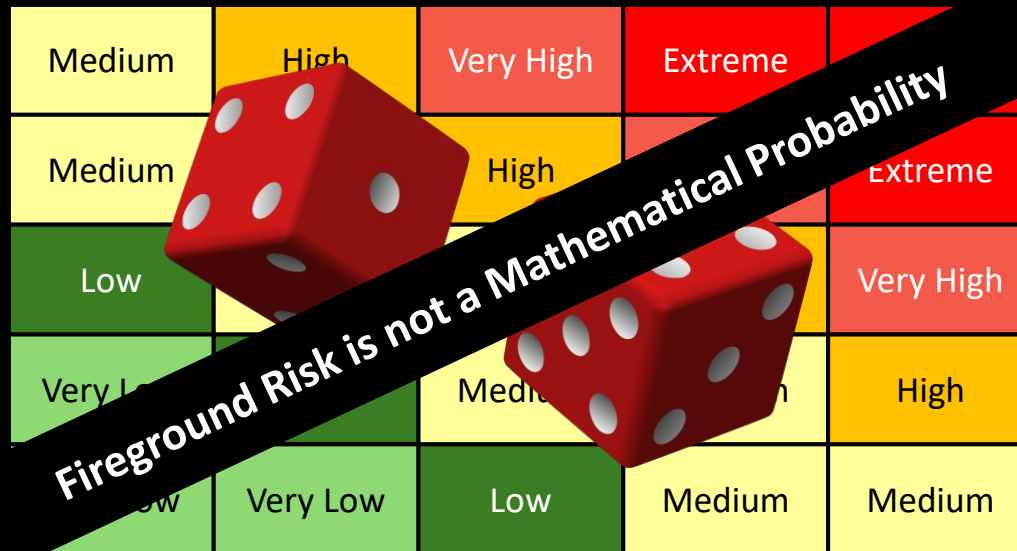
Size-Up Starts with 3 Questions

1. What's the problem?
2. What's in the way of achieving the tactical objectives?
 - *Fire Control*
 - *All Clear*
 - *Loss Stopped*
3. What can hurt or kill me?



Risk Management is about the Why!

A **hazard** is anything that could cause harm.



The image shows a 5x5 risk matrix with a diagonal banner reading "Fireground Risk is not a Mathematical Probability" and two red dice. The matrix cells are colored and labeled as follows:

Medium	High	Very High	Extreme	Extreme
Medium	High	High	Extreme	Extreme
Low	High	Very High	Very High	Very High
Very Low	Medium	Medium	High	High
Very Low	Very Low	Low	Medium	Medium

Risk is a combination of probability and severity of harm from a hazard.

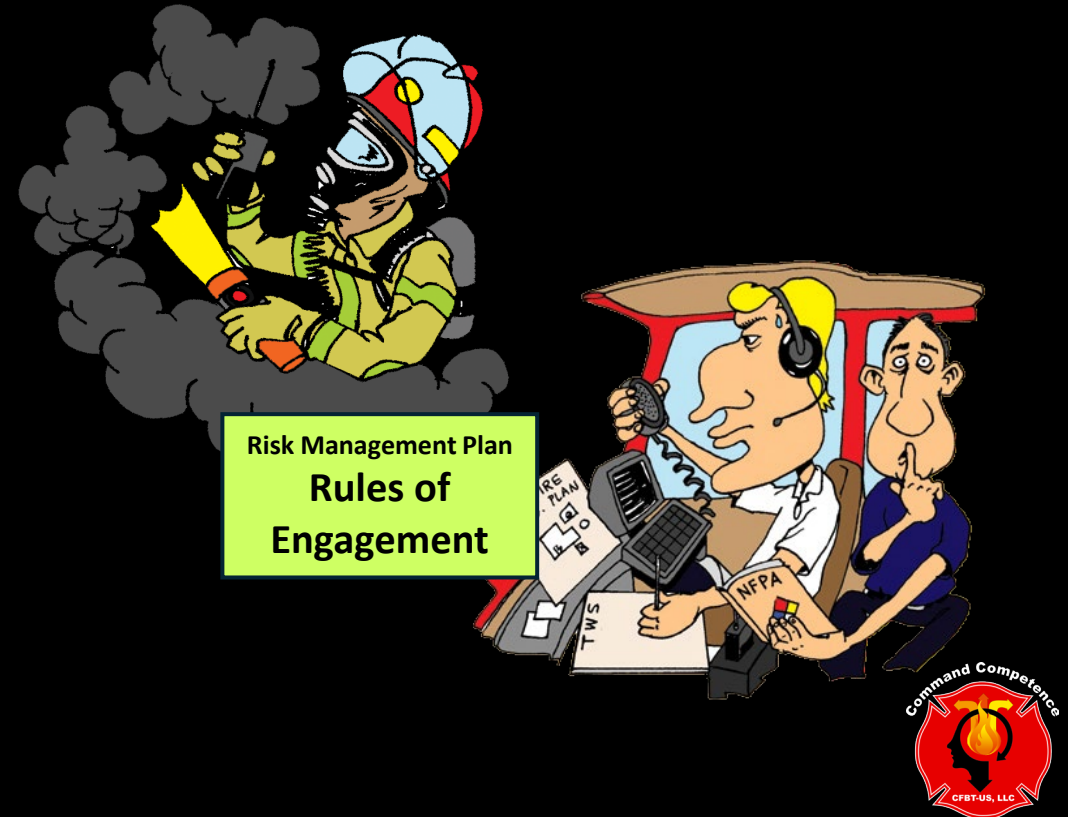
We operate in a deliberate and calculated manner!

- **We will not risk the lives of our members for lives or property that is already lost.**
- **We will accept limited risk to save savable property.**
- **We will accept a greater level of risk to protect savable lives.**



Is there a Safety Problem?

1. Is it reasonable to believe that the building is occupied?
2. Can I recognize searchable space?
3. Can I do something about it?





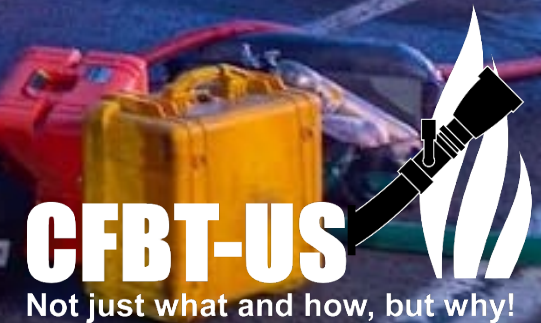
“This is about managing real work
and doing it over and over again!”

DC Chris Stewart



Serious Injury Incident

1327 SE 182nd Avenue
Gresham, OR
May 30, 2024, at 21:04

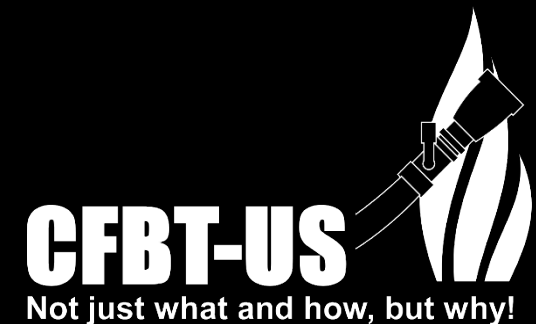




Firefighter Spencer Tejedas

A starting point and framework...

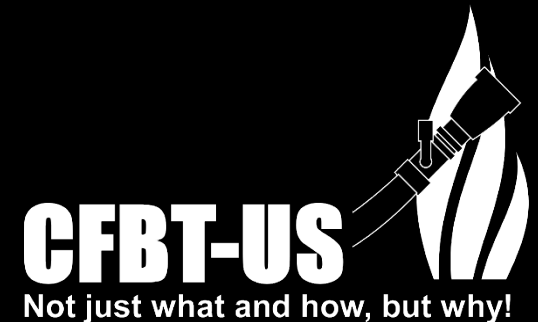
- Firefighters and fire officers go to work wanting to do a good job, serving their community and being able to go home to their family at the end of their shift.
- Decisions that make sense to the decision maker at the time may look considerably different with 20/20 hindsight.



Purpose of this discussion is to examine:



- The timeline and sequence of events.
- Fire dynamics and fire behavior indicators.
- Strategy, tactics, and decision-making.
- Lessons learned and the way forward.
- Potential to encounter a similar incident.



Common Understanding

From the compressible to the incompressible

Entropy $s(x,t)$ defined by Gibbs

$$\Leftrightarrow s = S(e,p) \text{ with } \left(\frac{\partial S}{\partial e}\right)_p = \frac{1}{T} \text{ and } \left(\frac{\partial S}{\partial p}\right)_e = -\frac{1}{\rho}$$

$$\Rightarrow \text{Budget law: } \frac{de}{dt} = T \frac{ds}{dt} + \frac{1}{\rho}$$

$$\text{Using } \underline{\sigma} = -p \underline{I} + \underline{\tau} \text{ and } p_c$$

$$\rho \frac{ds}{dt} = \frac{\rho}{T} - \frac{div Q}{T} + \frac{\underline{\tau} : D}{T}$$

Second principle of thermodynamics

$\Rightarrow$ constraint of behaviour

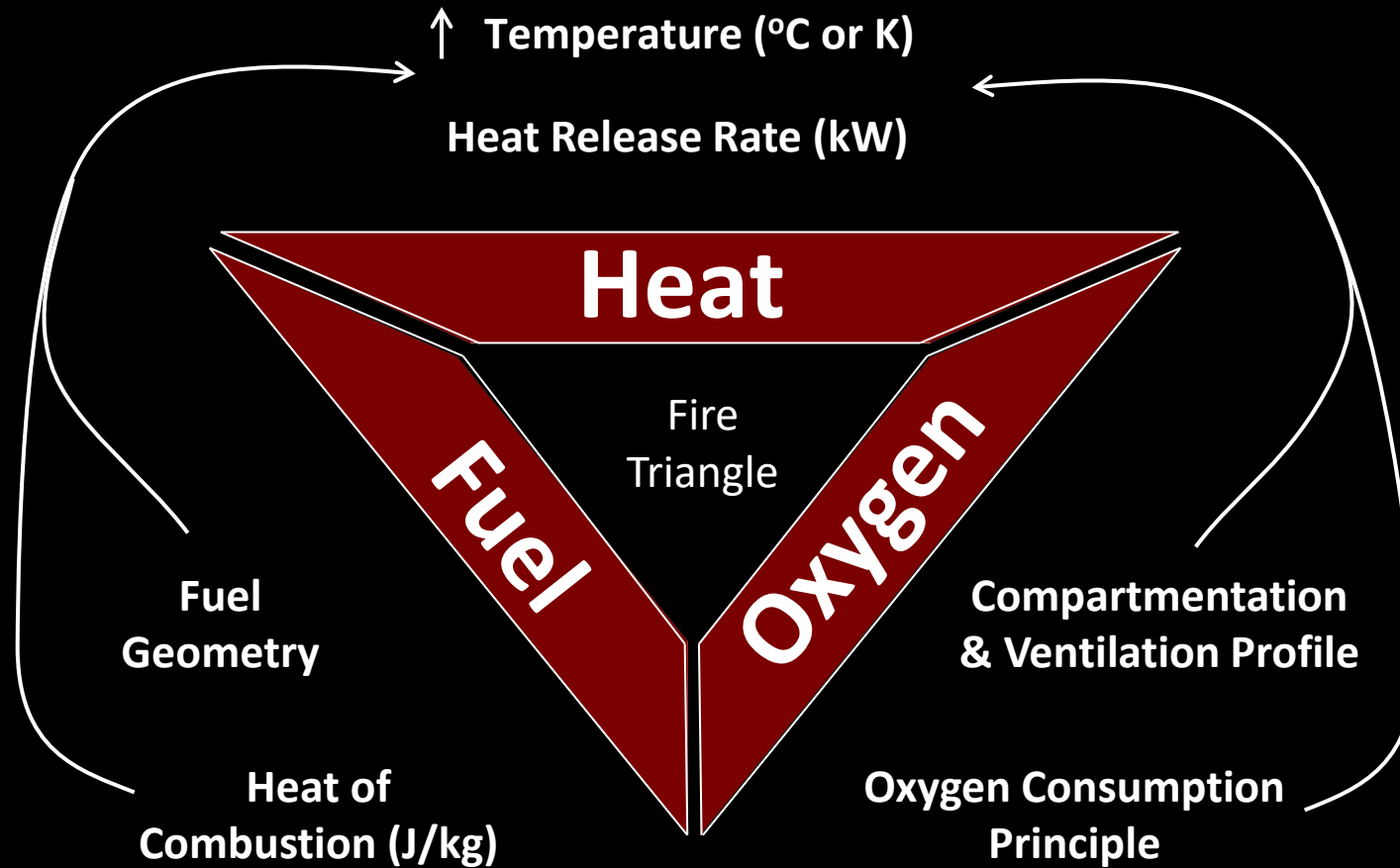
Compressible Navier-Stokes

$$\rho \frac{dp}{dt} = -\rho div \underline{u}$$

information

Fire Dynamics

Fundamental Concepts



Fire Dynamics

Fundamental Concepts

Single Candle



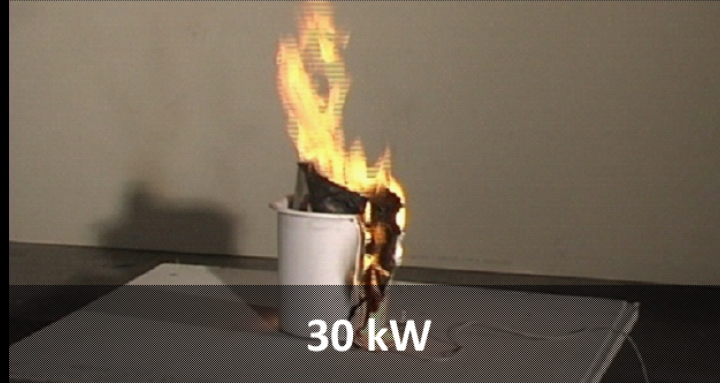
80 W

Four Candles



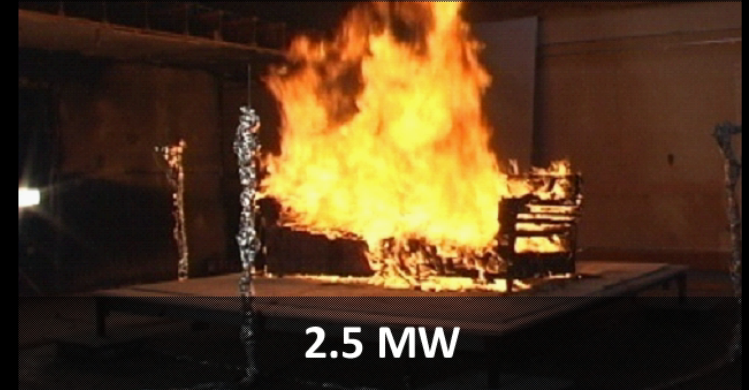
320 W

Trash Can



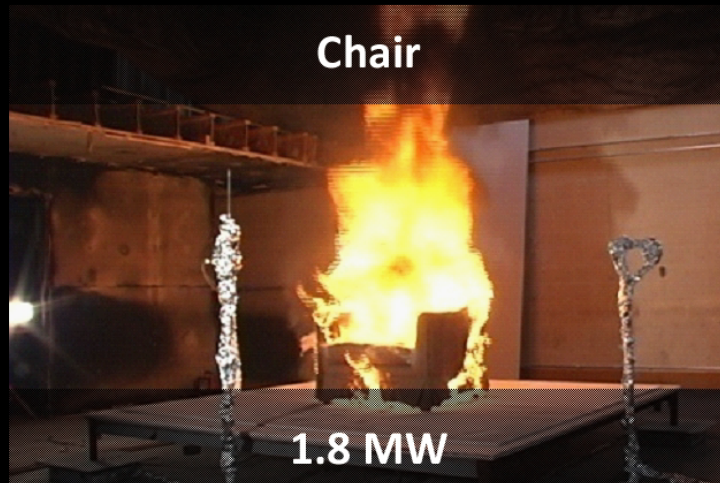
30 kW

Sofa



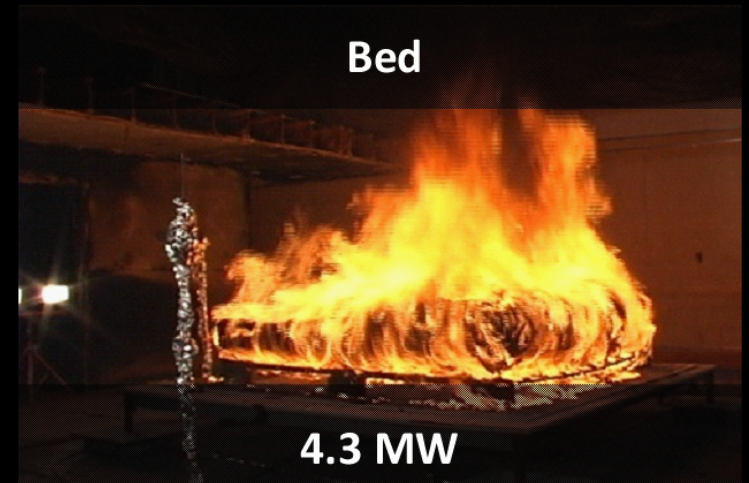
2.5 MW

Chair



1.8 MW

Bed



4.3 MW

Fire Dynamics

Fundamental Concepts



Release of energy in oxidation is proportional to the mass of oxygen consumed.

13.1 MJ/kg of O₂

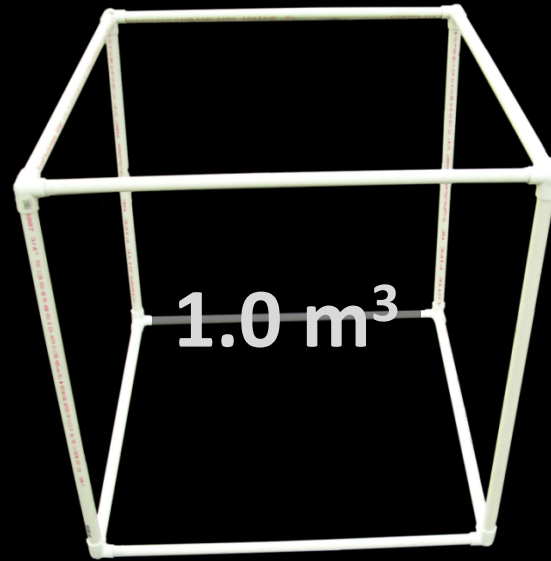
William Thornton (1917)
*The Relation of Oxygen to the Heat
of Combustion of Organic Compounds*

Fire Dynamics

It is considerably easier to think of air in terms of volume...

$$\begin{array}{r} 1.2 \text{ kg/m}^3 \\ \times 3.0 \text{ MJ/kg} \\ \hline 3.6 \text{ MJ/m}^3 \end{array}$$

Each cubic meter of air provides the oxygen to release 3.6 MJ of energy.



Dry Air 1.2 kg/m³

Fundamental Concepts



$$11.9 \text{ m} \times 8.0 \text{ m} \times 2.4 \text{ m} = 228.5 \text{ m}^3$$

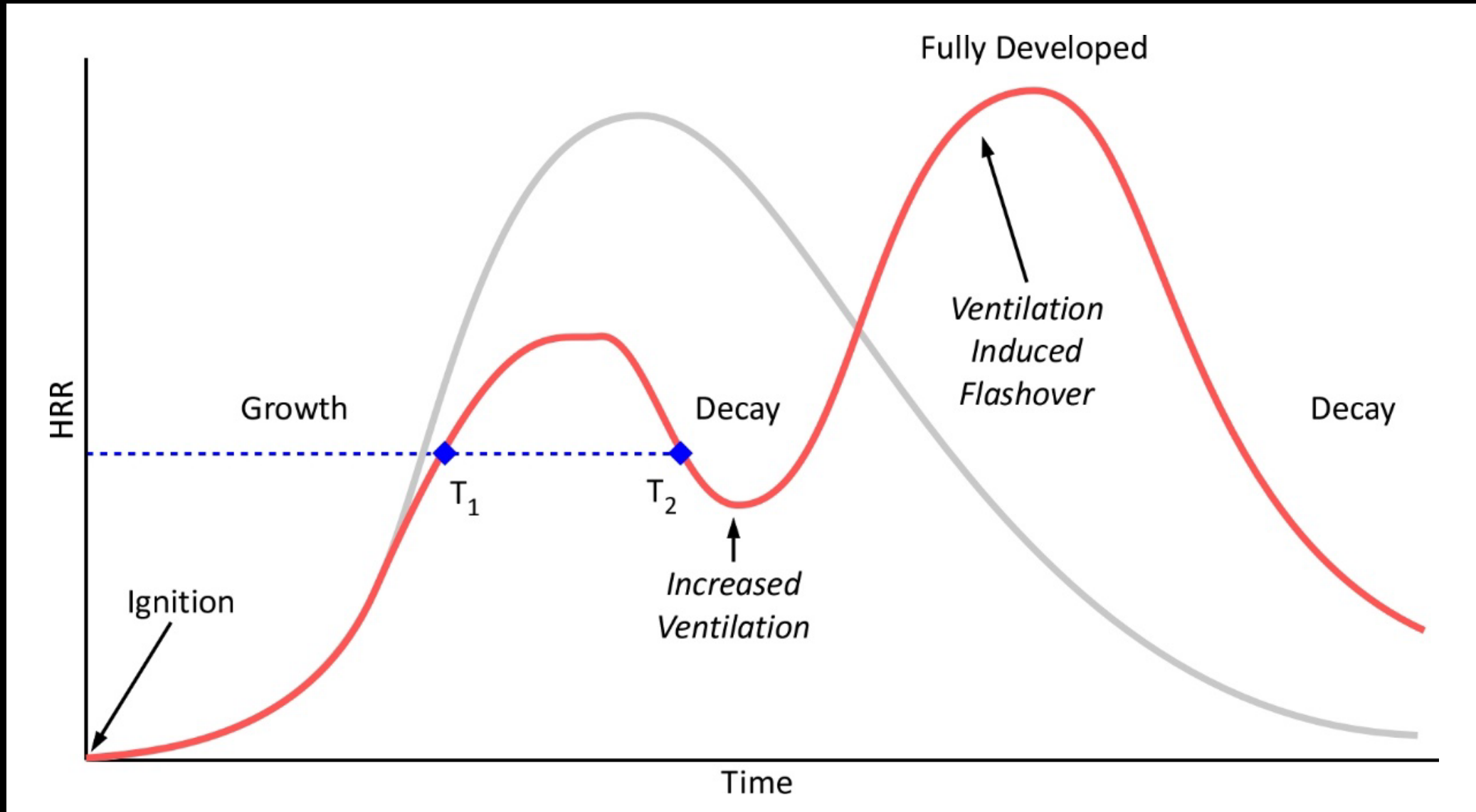
A 4 MW Fire would use 1.1 m³/s

$$228.5 \text{ m}^3 / 1.1 \text{ m}^3/\text{s} = 207.7 \text{ s} \\ (\text{or } 3.46 \text{ min})$$

But... flaming combustion ceases at approximately 16%

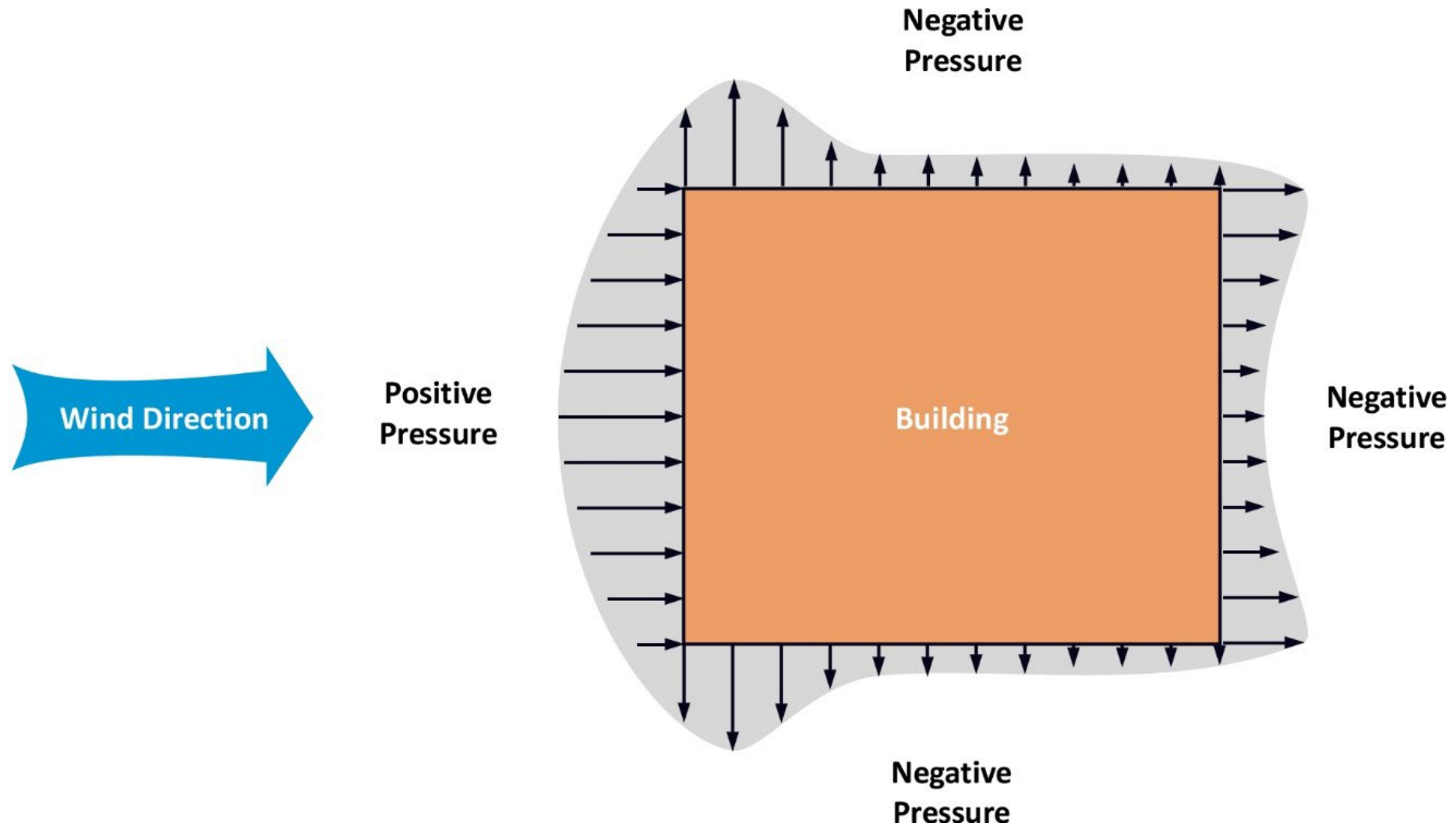
Fire Dynamics

Fundamental Concepts



Fire Dynamics

Fundamental Concepts



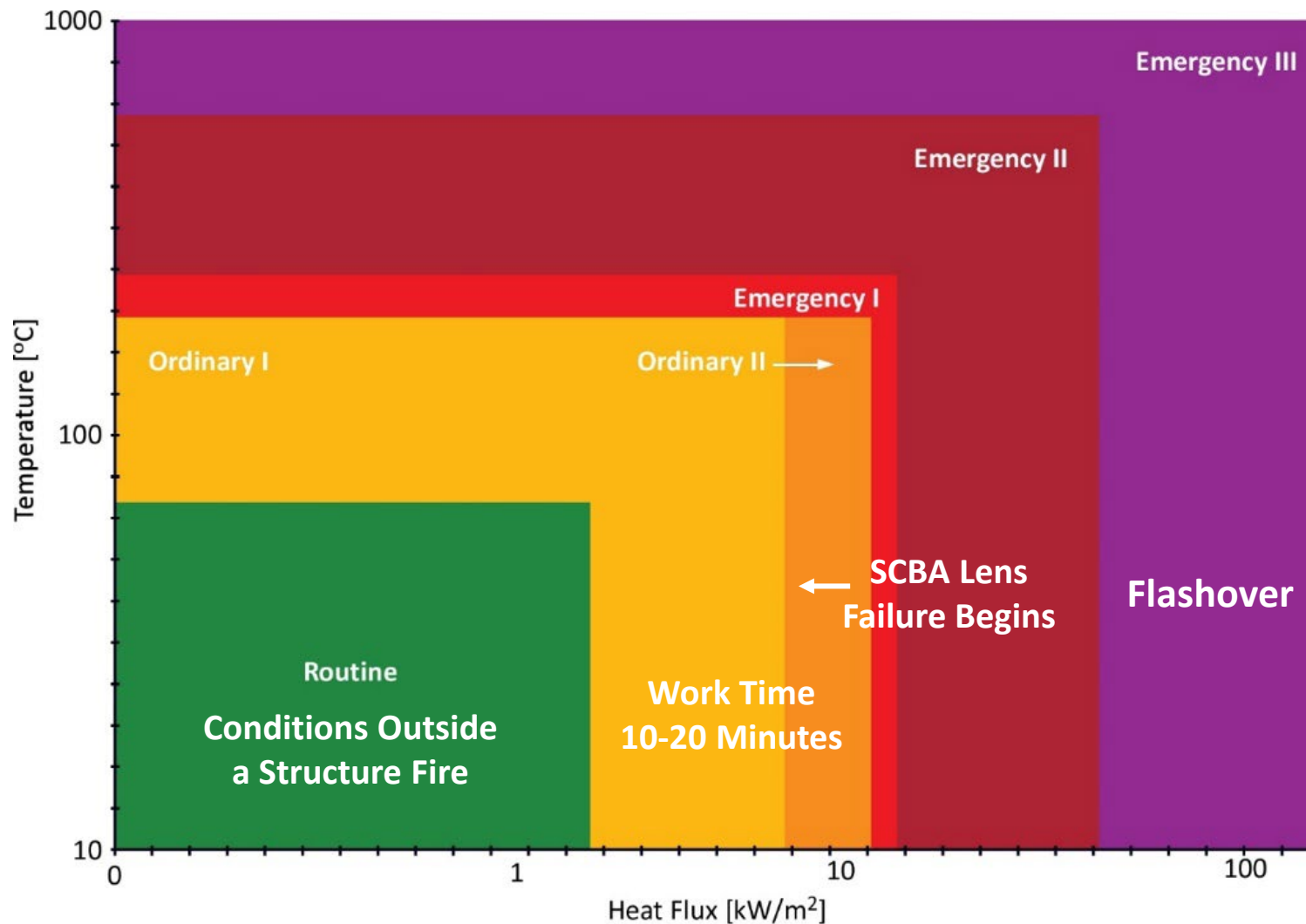
Fire Dynamics

Fundamental Concepts



Fire Dynamics

Fundamental Concepts



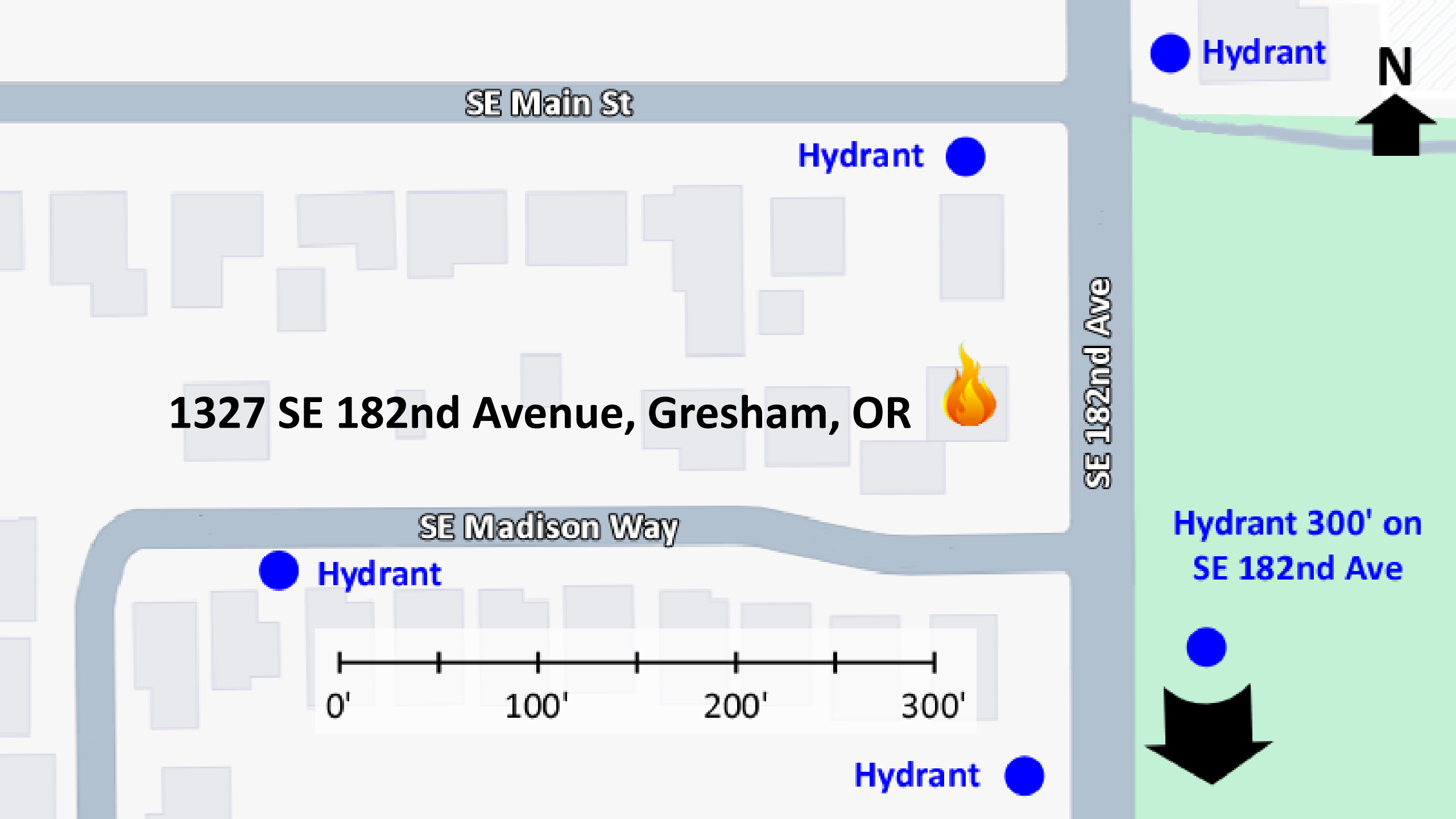
Fire Dynamics

Fundamental Concepts



“If you add air to the fire and don’t apply water in the appropriate time frame the fire gets larger and safety decreases.”

Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction
(Steve Kerber, UL-FSRI)



SE Main St

Hydrant

Hydrant

N

1327 SE 182nd Avenue, Gresham, OR



SE 182nd Ave

SE Madison Way

Hydrant

Hydrant 300' on
SE 182nd Ave



Hydrant



Main Fire
Occupancy

SE 182nd Avenue

Bravo 1
Exposure

SE Madison Way



Bravo 1 Exposure

Side Bravo

Side Alpha



Bravo 1 Exposure

Side Bravo



Side Alpha



Bravo 1 Exposure

Side Bravo

Side Alpha



Side Delta

Side Alpha

Bravo 1 Exposure

Side Charlie

Side Bravo





Side Delta

Side Alpha



SE 182nd Avenue

Main Fire
Occupancy

Bravo 1
Exposure

SE Madison Way



Bravo 1 Exposure

Side Charlie

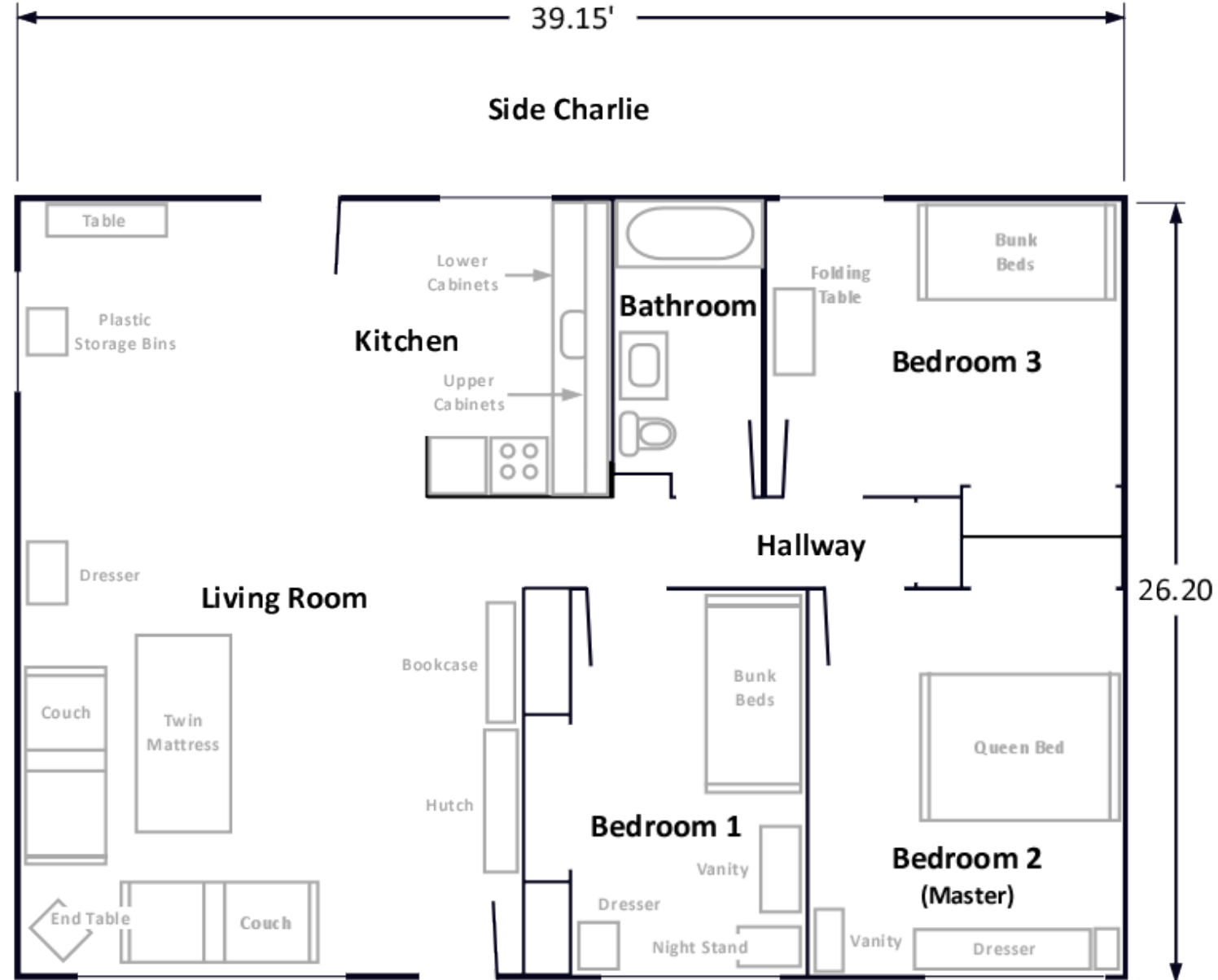


Side Charlie



Side Delta

Floor Plan



Living Room



Alpha

Bravo

Dining Area

Bravo

Charlie



Kitchen



Bedroom 1

Alpha



Bedroom 1

**Door to
Hallway**



Bathroom

Side Charlie

PVA Plastic
Shower Curtain
(Not Shown)

ABS Plastic Tub
& Surround



Bedroom 2

Alpha

Delta



Bedroom 2



Delta

Bedroom 3

Charlie



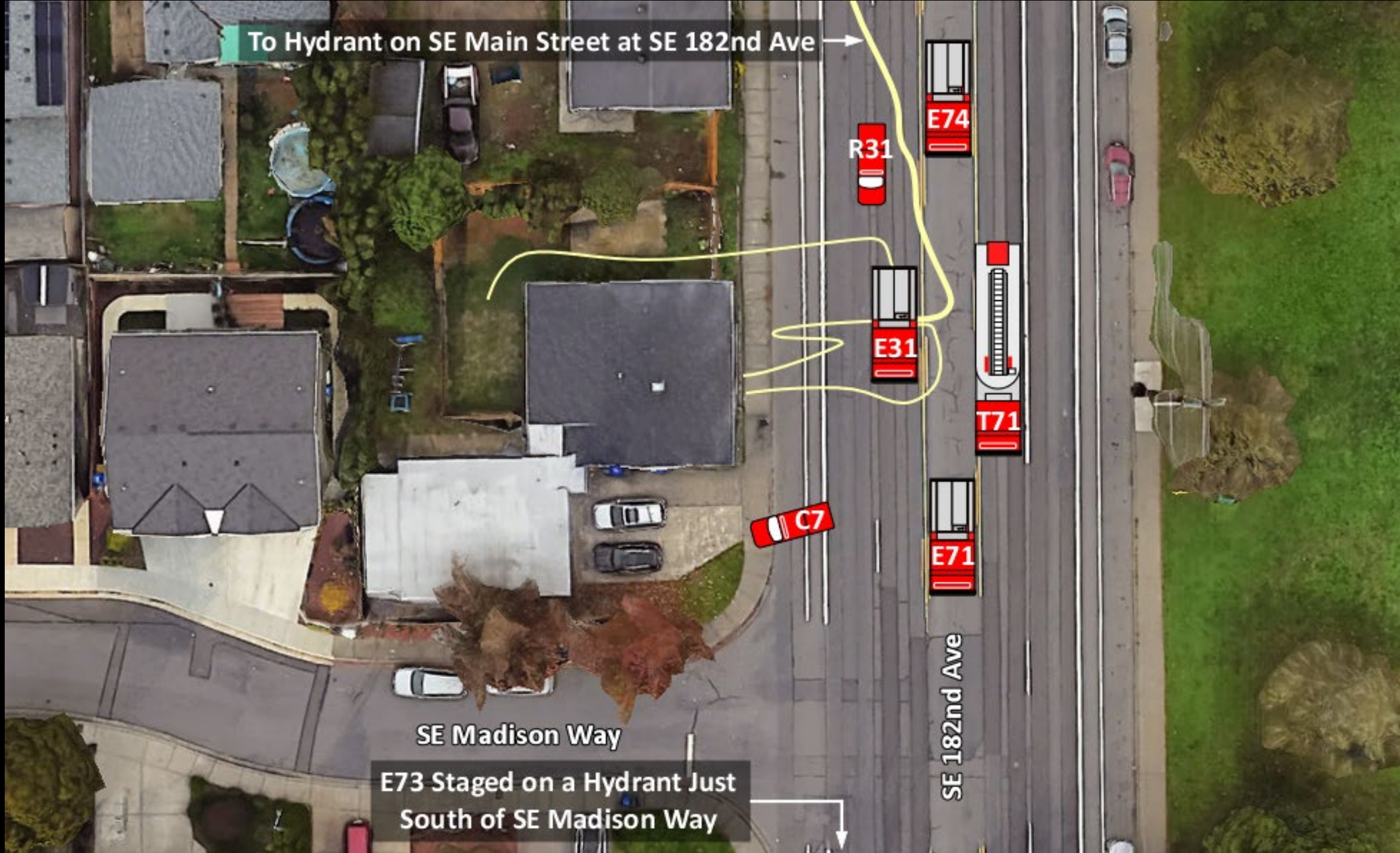
Bedroom 3

Charlie

Delta



Apparatus Positioning



Incident Timeline

Ignition

21:02:43 **911 Call reporting the fire.**

Ventilation by occupant & bystanders.

21:03:40 **Dispatch.**

21:07:08 **Engine 31 & R31 arrive.**

Occupant and bystanders report trapped child (or children).

21:08 **E31 B (Tejedas & Pilarski) enters through Alpha.**

FF from R31 (Ingram) enters through Charlie.

Incident Timeline

21:08 **E31 AO deploys attack line on Alpha.**

Flashover

21:08 **First E31 FF (Pilarski) out through door on Alpha.**

R31 FF (Ingram) out.

21:09 **Ineffective water on the fire.**

21:10 **Second E31 FF (Tejedas) out through window on Alpha (BR 2).**

21:12 **Fire knocked down.**

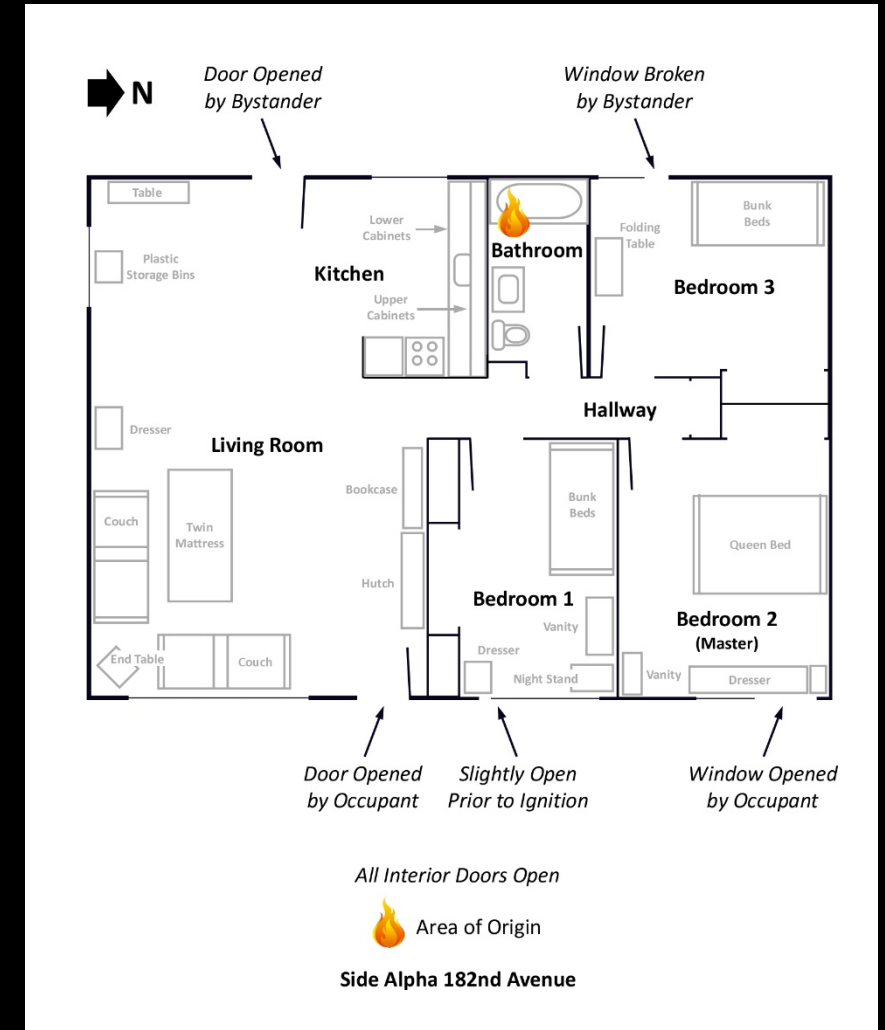
Arrival to Knockdown

00:04:42

Fire Behavior Analysis

- The building was originally constructed as a single-family home in 1956.
- The garage was converted into a second dwelling unit in 2010.
- The fire occupancy was 936 square feet (ft²) with a 330 ft² covered patio on Side Charlie.
- The fire occupancy contained three bedrooms, one full bathroom, and an open living room, dining area and kitchen.
- The interior finish was gypsum board with laminate flooring.

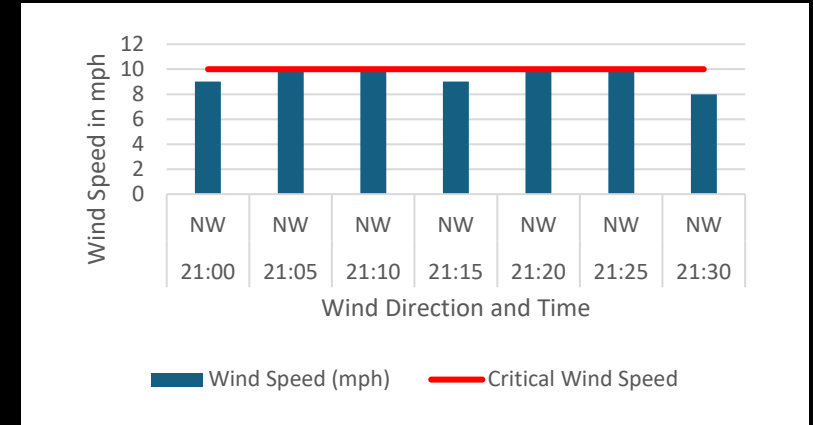
The Building



Fire Behavior Analysis

Weather

- The weather in Gresham, Oregon on the evening of May 30, 2024, was seasonable with a temperature of between 61o F and 62o F, no precipitation, and a wind speed between 8 mph and 10 mph from the northwest.
- With a wind speed of 10 mph, there is potential for a wind driven structure fire event. However, wind effects may have been mitigated to some extent by the patio roof, fence, and tall vegetation to the northwest of the fire occupancy.



Fire Behavior Analysis

Cause & Origin

- Electrical power had been shut off to the fire occupancy the day prior to the fire and occupants had been using candles for lighting.
- The fire originated in the bathroom located approximately in the middle of the building on Side Charlie.
- The fire investigator's report indicated that the area of origin was located at or near the bathtub with the most probable cause being unattended candles.



Fire Behavior Analysis

- A likely scenario for ignition and subsequent fire development would be that an unattended candle left burning on the side of the bathtub ignited the plastic shower curtain and extended to the tub and shower enclosure.
- The shower curtain was made of polyethylene vinyl acetate (PEVA).
- The tub and wall surround are constructed of acrylonitrile butadiene styrene (ABS) plastic with an acrylic finish.

Cause & Origin



Fire Behavior Analysis

Cause & Origin

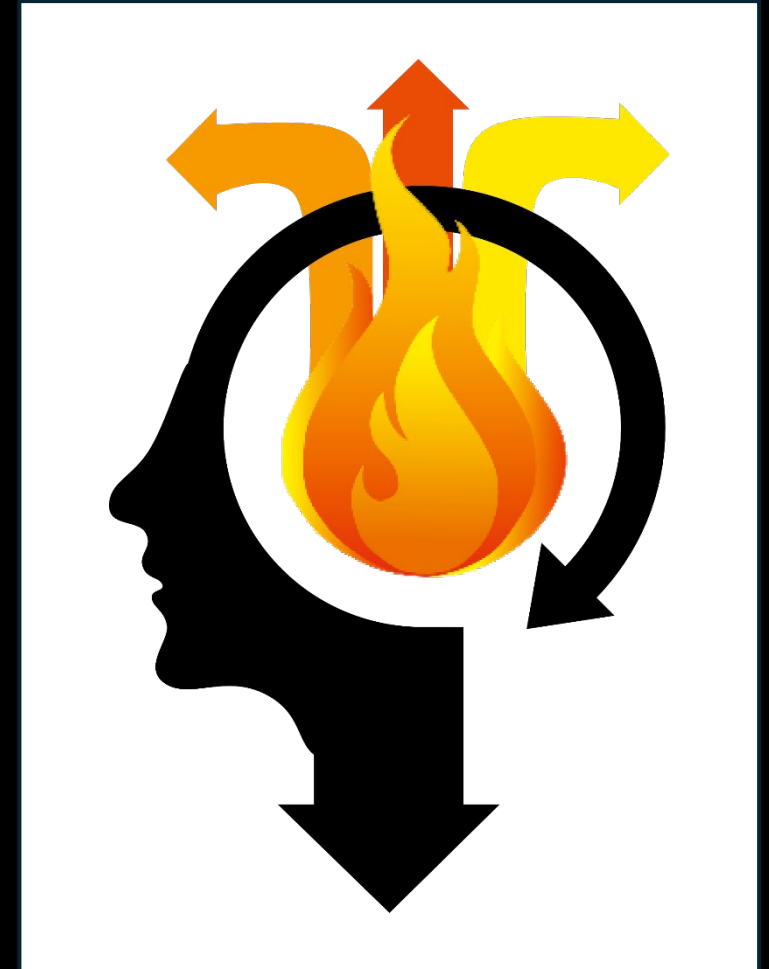
- If all surfaces of the tub surround were burning at once and had sufficient oxygen to support flaming combustion, HRR would be about 8 MW (>4 times that needed for flashover based on the doorway ventilation).
- Even with a lower input heat flux, the HRR/unit of surface area would still be approximately 900 kW/m² generating a HRR of about 4 MW (> than needed to flashover the bathroom).



Fire Behavior Analysis

- Once ignited, the plastic shower curtain melted and burned, igniting the tub and shower enclosure.
- The fire entered the growth stage with smoke and flames exiting the upper area of the bathroom door and into the hallway.
- Hot smoke traveled laterally through the hallway into adjacent compartments through open doors, developing a smoke layer throughout the house.

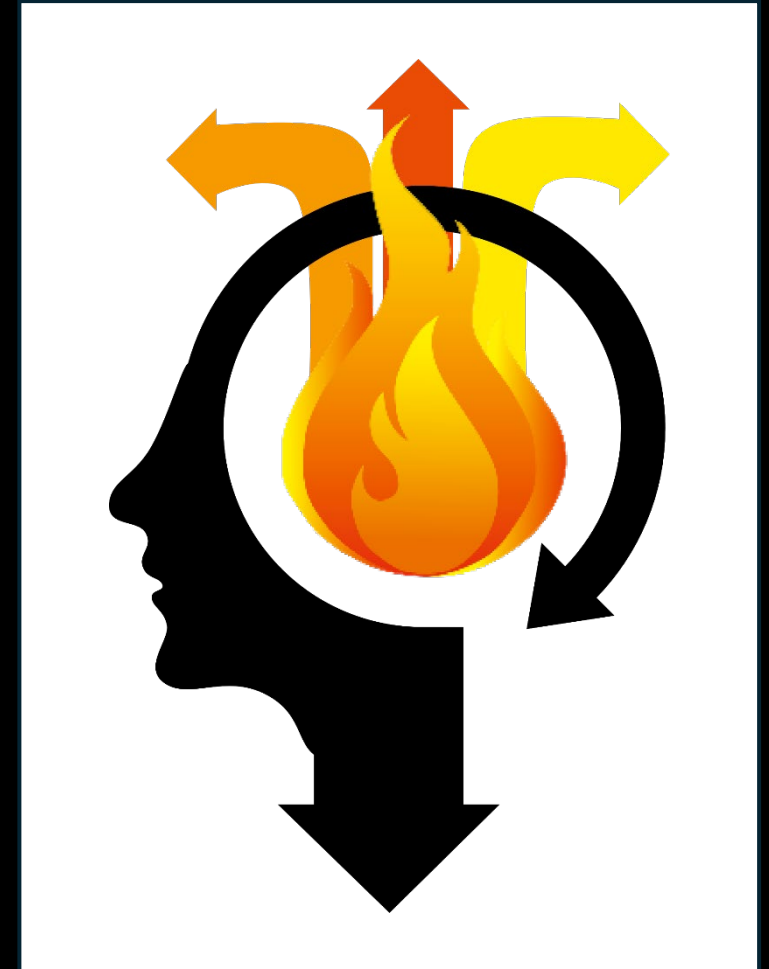
Fire Development



Fire Behavior Analysis

- Radiant and convective heating from the hot smoke layer, heated fuel packages in the adjacent compartments, resulting in pyrolysis (particularly involving fuel packages located at upper levels within these compartments).
- As all exterior doors were likely closed and one window in the bedroom on Side Alpha was slightly open at the time of ignition, the fire would have transitioned relatively quickly from a fuel limited to ventilation limited burning regime.

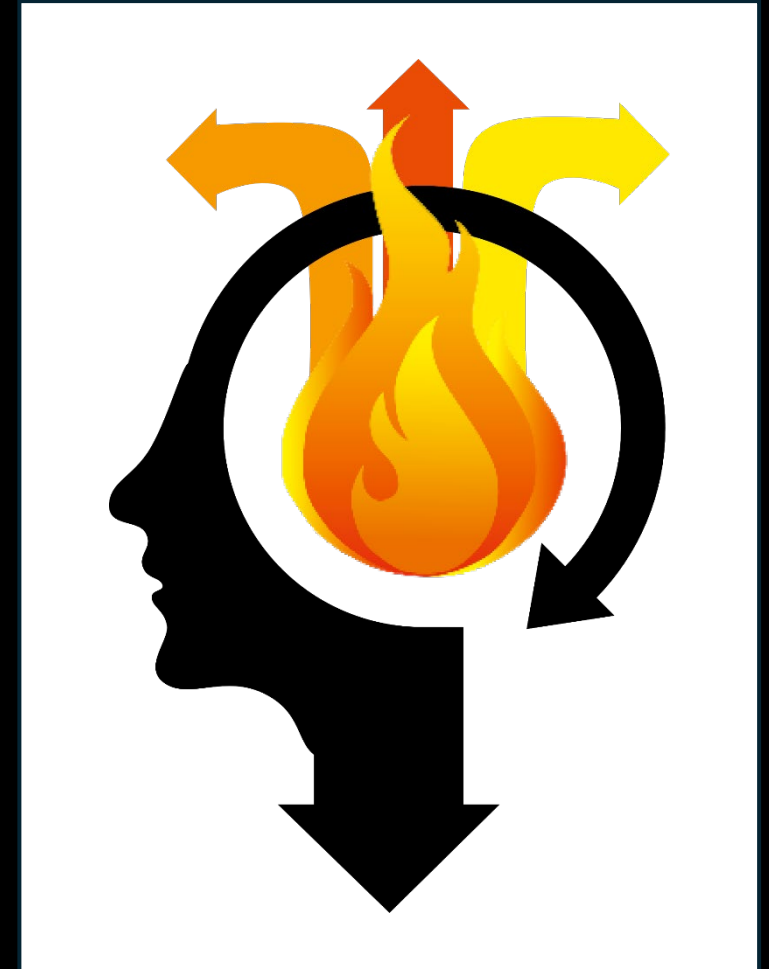
Fire Development



Fire Behavior Analysis

- Once vent limited, the HRR from the fire would have been reduced and the fire eventually entering the decay stage due to reduction in oxygen concentration.
- Smoke production would have continued, filling all compartments within the house with smoke.
- An occupant arrived home and opened 1) the front door, 2) the window in Bedroom 2.
- Civilian bystanders kicked in the kitchen door located on Side Charlie and broke a hole the window in Bedroom 3.

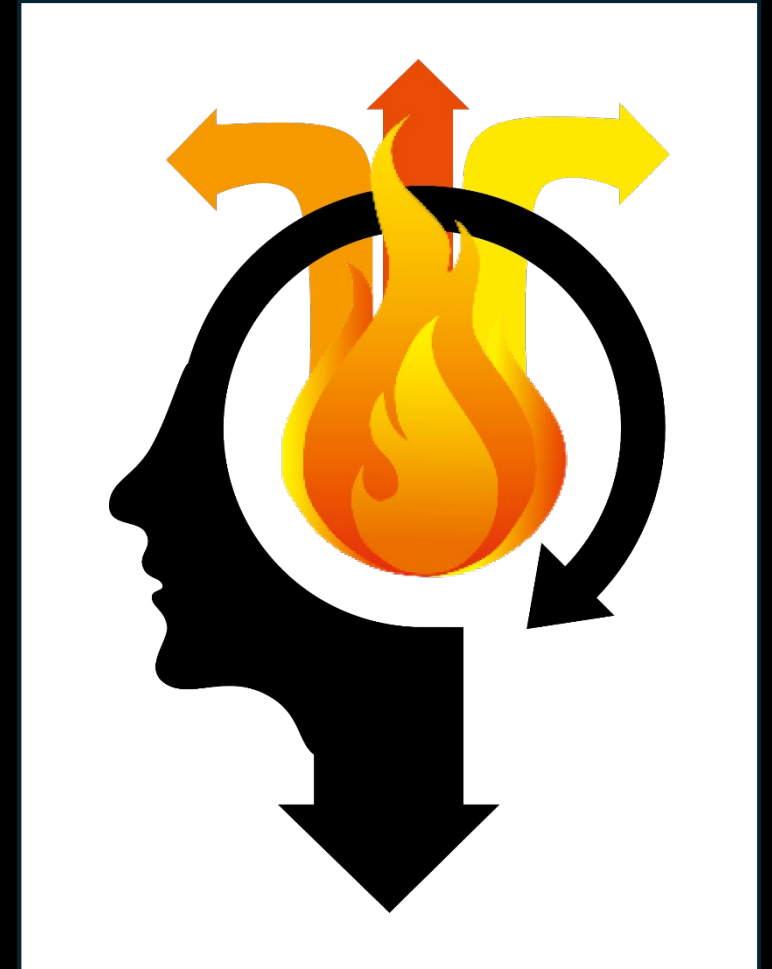
Fire Development



Fire Behavior Analysis

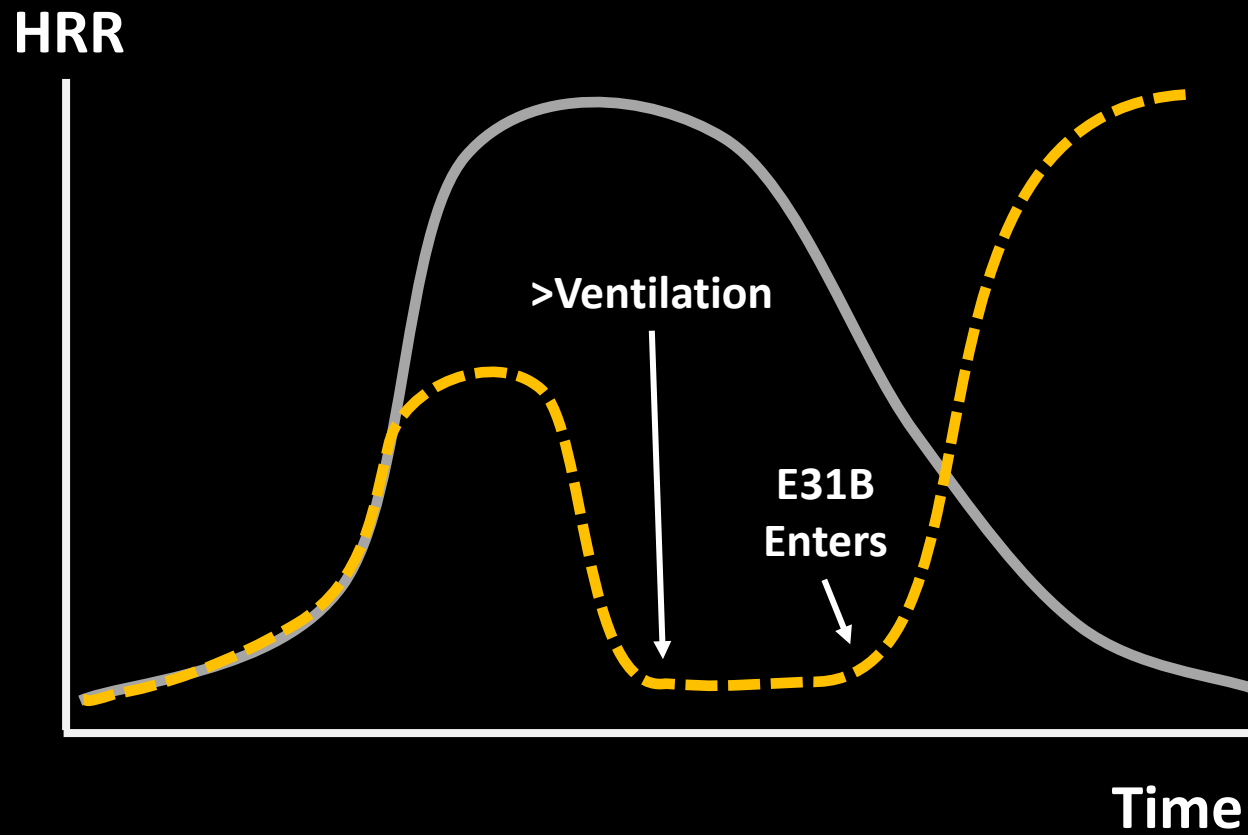
- The fire returned to the growth stage with flaming combustion in the bathroom and on the ceiling of the hallway.
- Flaming combustion started to extend along the ceiling from the hallway into the living room prior to Firefighters Spencer Tejedas and Jack Pilarski making entry on Side Alpha.

Fire Development



Fire Behavior Analysis

Fire Development





0:00:00



0:00:05



0:00:10



0:00:20



0:00:30

Fire Behavior Analysis

Ventilation Openings

Pre-Flashover:

- Door on Side Alpha.
- Windows in Bedroom 1 and 2.
- Door on Side Charlie.
- Window in Bedroom 3.



Post-Flashover:

- Living Room Window on Side Alpha.
- Window on Side Bravo.
- Window in Bedroom 2.



Fire Behavior Analysis

Ventilation Openings

Pre-Flashover:

- Door on Side Alpha.
- Windows in Bedroom 1 and 2.
- Door on Side Charlie.
- Window in Bedroom 3.



Post-Flashover:

- Living Room Window on Side Alpha.
- Window on Side Bravo.
- Window in Bedroom 2.



Fire Behavior Analysis

- Prior to Firefighters Tejedas and Pilarski entry through the door on Side Alpha, there were multiple flow paths between the fire in the bathroom and hallway.
- Air was entering from the bottom of the door on Side Alpha and from the door on Side Charlie.
- Smoke was exiting from the upper area of the door on Side Alpha and bedroom windows on Sides Alpha and Charlie.

Flow Paths



Fire Behavior Analysis

- Firefighters Tejedas and Pilarski had moderate visibility as they entered the house below the smoke layer which was approximately 3' to 4' above the floor.
- In the living room, fingers of flame from the hallway were visible in the smoke layer and rollover was observed on the hallway ceiling.
- Temperature and heat flux in the hallway increased rapidly due to flaming combustion in the upper layer.

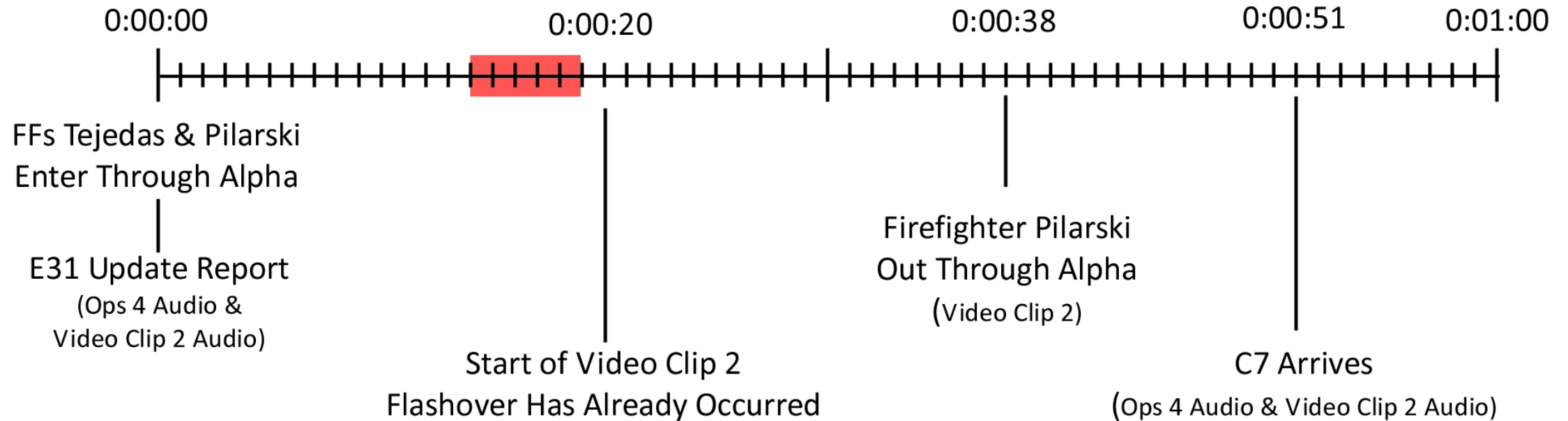
Flow Paths



Fire Behavior Analysis

Entry to Flashover Timeline

Elapsed Time [h:mm:ss]



 Probable Flashover Time Frame

Time line based on C7 reporting arrival on approach.

Video Clip 2
00:10





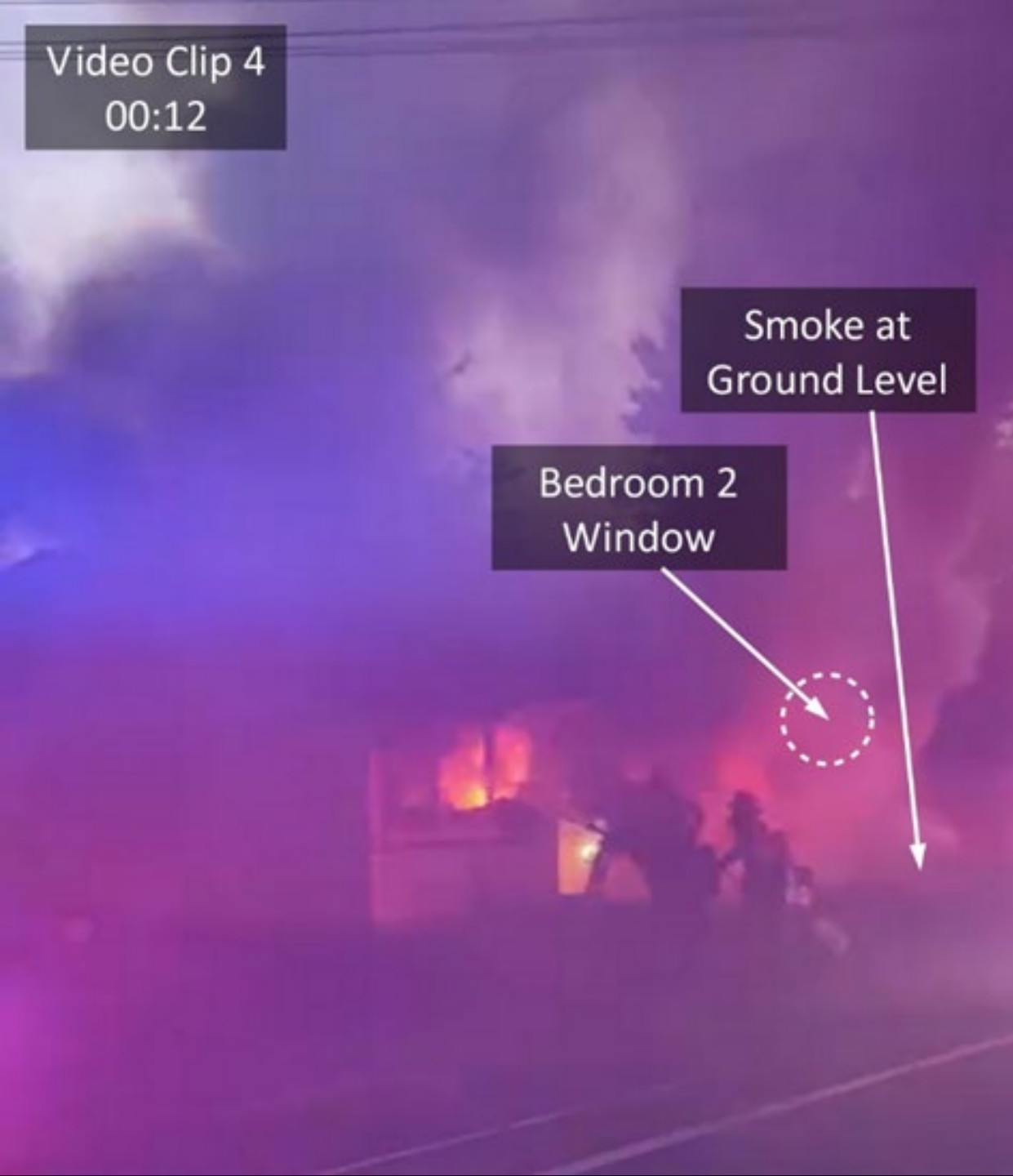
Shortly after flashover, Firefighter Pilarski exited through the door on Side Alpha with flames pushing from the open door to within approximately 1' of floor level.

Immediately after Firefighter Pilarski exited, the window on Side Bravo failed with a unidirectional outward flow.

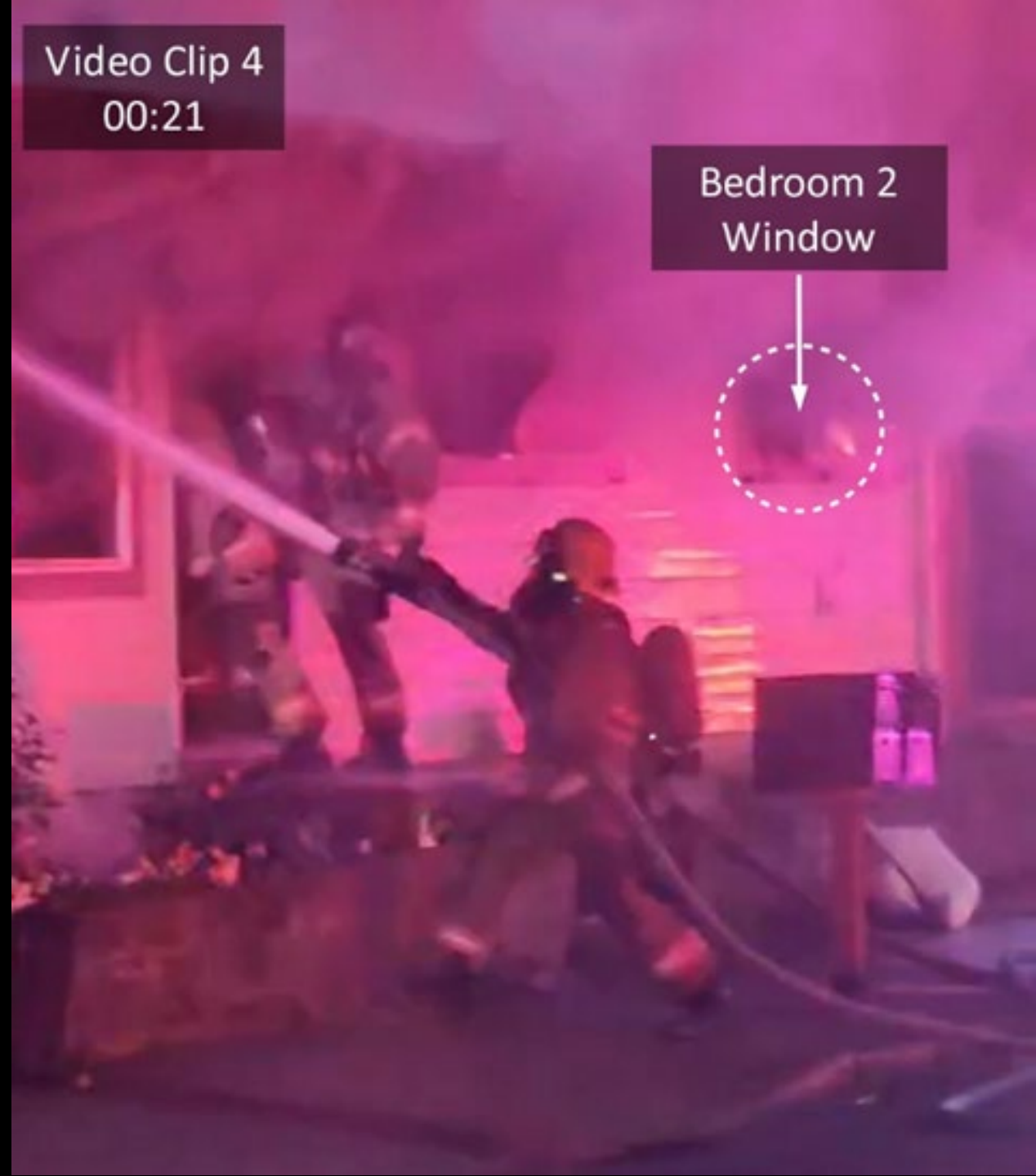
Firefighter Tejedas became disoriented in the living room and returned to Bedroom 2, exiting through the window after Firefighter Pilarski exited and before the fire was knocked down.



Video Clip 4
00:12



Video Clip 4
00:21



Video Clip 4
00:31

Firefighter
Tejedas



- Firefighter Tejedas had to navigate multiple obstructions to access the right side of the window, opened by an occupant prior to Engine 31's arrival.
- While thermal conditions in Bedroom 2 were untenable, there was little to no flaming combustion in this room due to low oxygen concentration.
- This room transitioned through flashover after the fire in the living room, kitchen, and hallway had been knocked down and Truck 71 vented the intact side of the Bedroom 3 window.





Firefighter Tejedas

**Flames Venting from the
Living Room Window
on Side Alpha**

Fire Behavior Analysis

Flow Paths

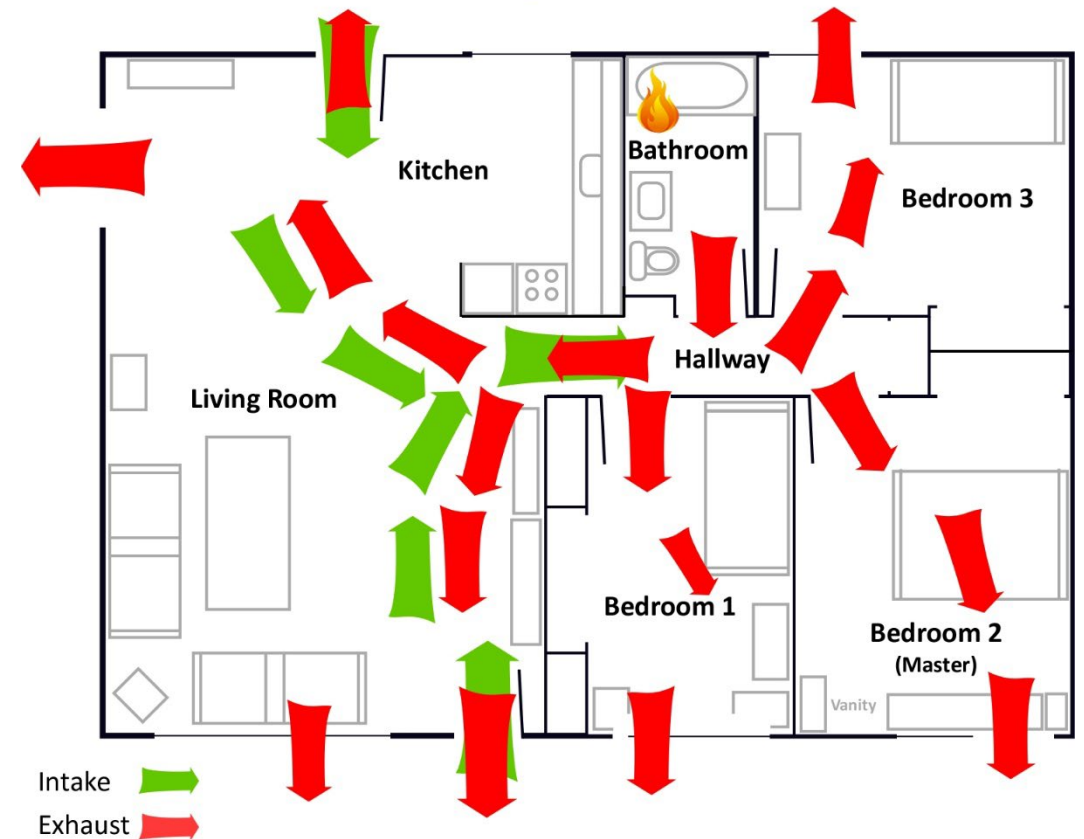
Pre-Flashover

Wind at 10 mph
from the NW



Post-Flashover

Wind at 10 mph
from the NW



Fire Behavior Analysis

Fire Control

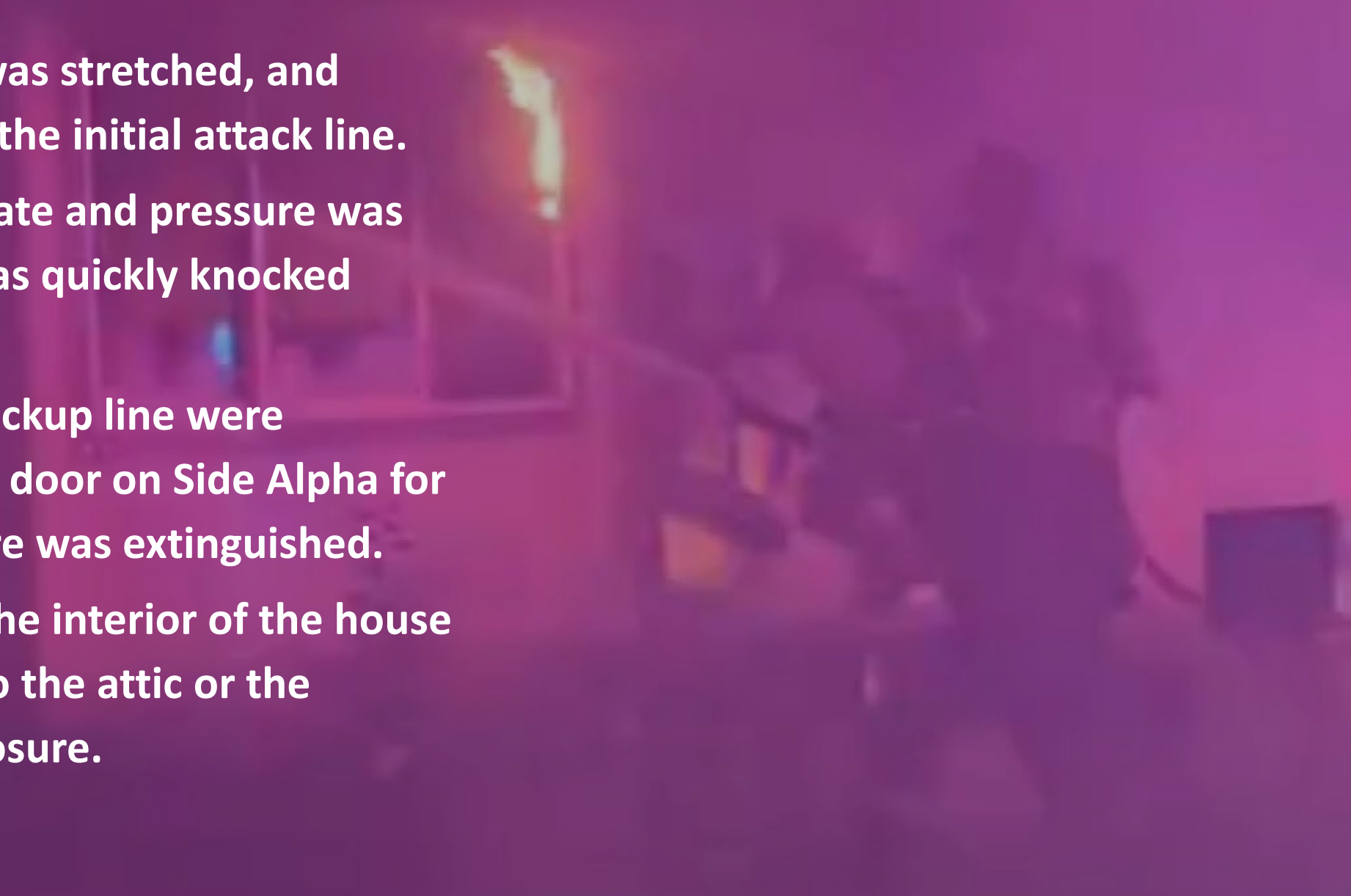
- Initial water application occurred post flashover but was ineffective due to severe kinking in the attack line that resulted in low pressure and flow.
- Lack of flow and pressure negatively impacted water mapping in the living room.
- Fire in the hallway, kitchen, and bedrooms was shielded from exterior water application from the doorway on Side Alpha.



Fire Behavior Analysis

Fire Control

- A second attack line was stretched, and pressure increased in the initial attack line.
- Once adequate flow rate and pressure was developed, the fire was quickly knocked down.
- The attack line and backup line were stretched through the door on Side Alpha for fire control and the fire was extinguished.
- Fire was confined to the interior of the house with no extension into the attic or the attached Bravo 1 Exposure.





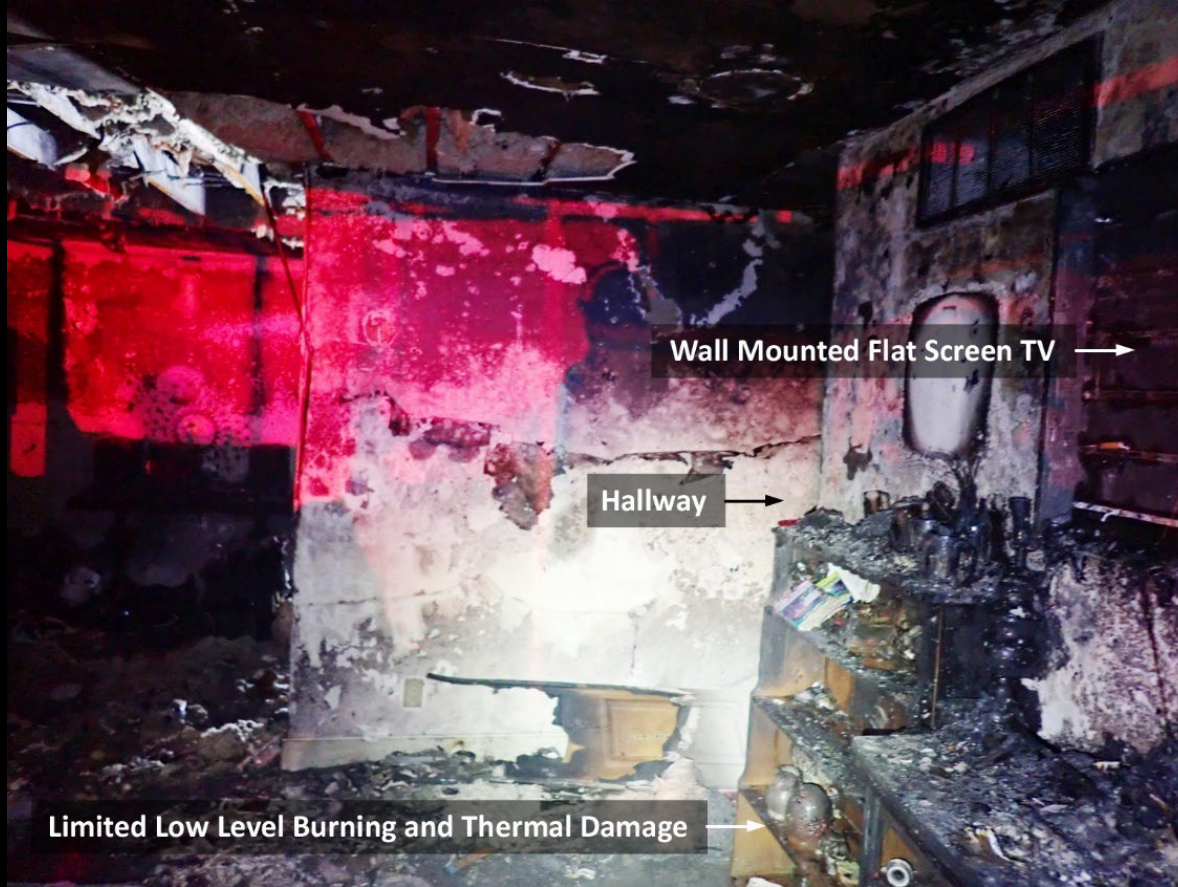


**Fire in the Living Room
Knocked Down**

**Flaming Combustion from
the Bedroom 2 Window**

Fire Behavior Analysis

Post-Fire Conditions



Living Room (Entryway)



Living Room/Dining Area

Fire Behavior Analysis

Post-Fire Conditions



Living Room (Bravo/Charlie Corner)



Living Room (Doorway Side Charlie)

Fire Behavior Analysis

Post-Fire Conditions



Kitchen



Hallway

Fire Behavior Analysis

Post-Fire Conditions



Bedroom 1



Bathroom (Room of Origin)

Fire Behavior Analysis

Post-Fire Conditions



Hallway



Bedroom 2

Fire Behavior Analysis

Post-Fire Conditions



Bedroom 3



UL Experiments on
Ventilation & Fire Patterns

Causal Landscape



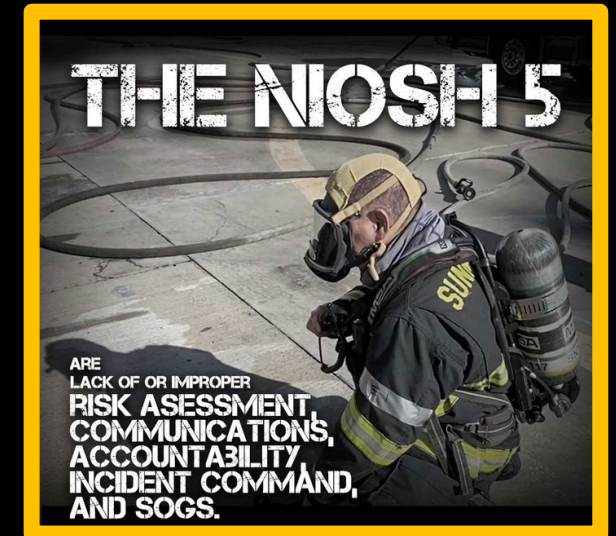
The concept is to portray a wide array of causes as a causal network, to help people escape from a single-cause, determinate mindset, but then to highlight a smaller number of causes that matter the most and that suggest viable courses of action.

Explaining Explanation Part 3: The Causal Landscape (Gary Klein, Metacognition, LLC)

Operational Assessment

Contributing Factors

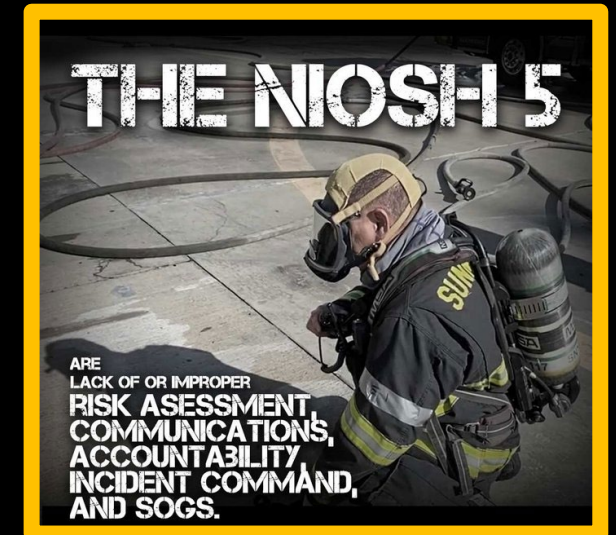
- **Insufficient risk assessment**/size up difficulties.
- **Lack of effective incident command** and control.
- Primary search without a hoseline or fire attack established.
- Lack of critical communications in requesting changes to tactics and tasks.
- **Loss of crew integrity and accountability.**
- **Radio/communication difficulties.**
- Rapid fire growth.



Operational Assessment

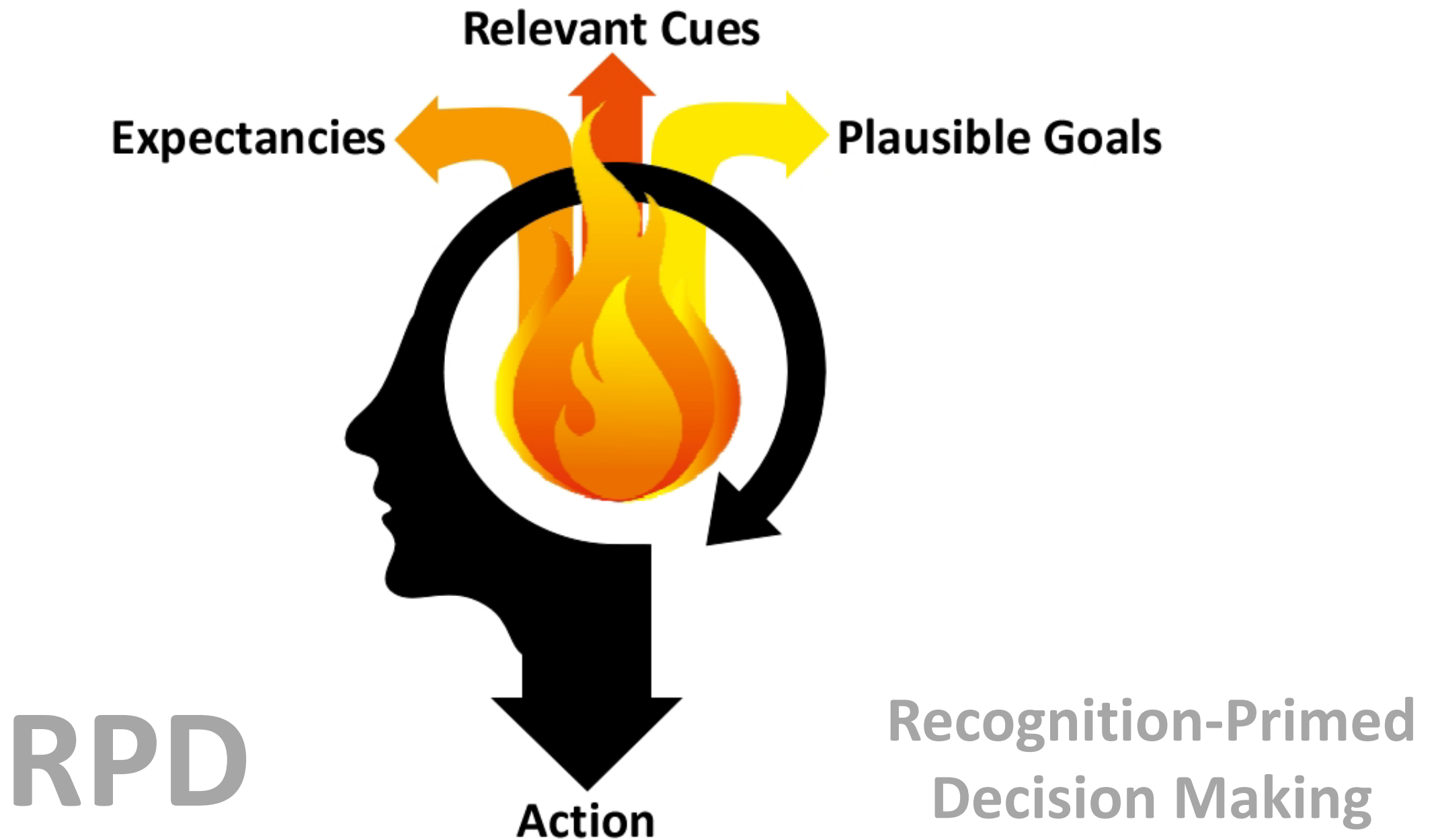
Contributing Factors

- Lack of effective standard operating guidelines (SOGs), and failure to follow established SOGs.
- Lack of training (fire behavior, officer development)
- Lack of City of Gresham support for fire department structure identified from decades of studies and recommendations



Other Considerations

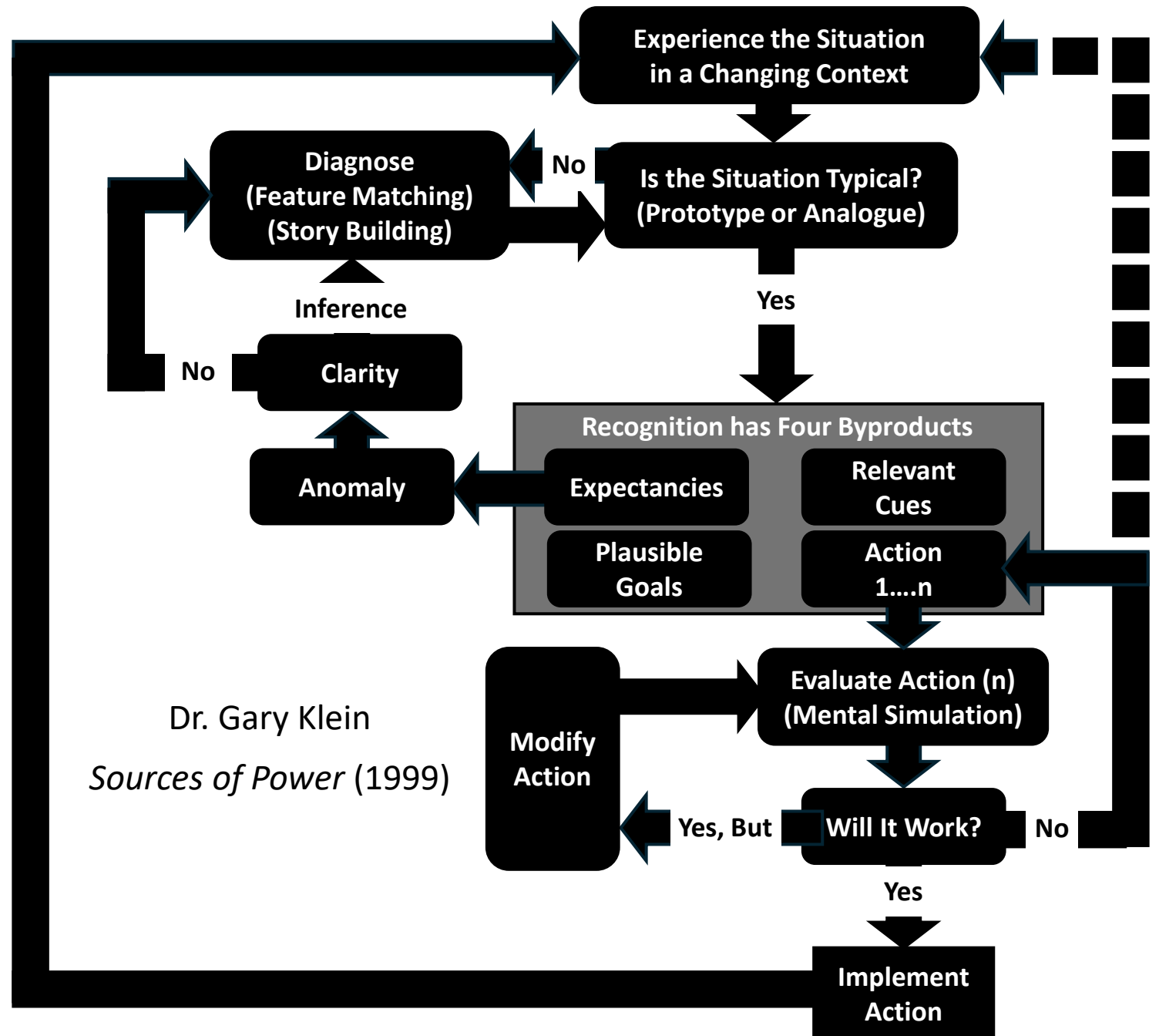
- Pre-arrival sensemaking (“someone thinks that there might be someone inside”).
- Maximal chaos on arrival (multiple bystanders reporting 1) a deaf and blind child inside, 2) “babies” inside, 3) multiple languages (English & Spanish).
- Command and control work practices (IC #1 staying in the cab of the apparatus)
- Organizational culture as an influence on fireground behavior (“kitchen table culture”, acceptance of freelancing).
- Experience (or lack thereof) impacting naturalistic decision-making.
 - *E31 Captain (25 years)*
 - *E31 Firefighters and apparatus operator (1-4 years)*
 - *BC (17 years, BC < 1 Year)*



RPD is a Cyclical Process



*Learning about the model explains
how and why but does not make
you a better decision-maker!*



Incident Audio





**Does this happen in your firehouse?
What are they thinking, saying, and learning?**

Real life presents the initial IC with diverse and dynamic challenges!
Some say it is better to be lucky than good, but chance favors the prepared mind!



Functions of Command = ICs Job Description

1. Deployment
2. Assumption, Confirmation, & Positioning of Command
3. Situation Evaluation
4. Strategy & Incident Action Planning
5. Communications
6. Organization
7. Review, Evaluate & Revise
8. Continue, Support, & Terminate Command





**On-Line Training
Simulation Lab
Continuing Education**

Common Operating Perspective



IC #1



IC #2

How do we make sense of what has, is, and will happen?



Reading the Fire ● Size-Up ● Situational Awareness

The First Arriving Company Officer (IC #1)

Where does IC #1 work?

Why is this the most difficult job on the fireground?

What factors impact IC #1's mental workload and focus?



Initial Radio Report

A photograph of a two-story house with light-colored siding and a brown roof. Thick, dark smoke is billowing from the roofline, partially obscuring the upper part of the house. The scene is set in a residential area with a lawn and some shrubs in the foreground.

1. Size
2. Height
3. Occupancy
4. Conditions
5. Initial Incident Action Plan
6. Strategy
7. Initiate & Name Command
8. Resource Determination

456 Main Street

Update Report

Results of the 360, including:

1. Stories on other than Side Alpha
2. Basement (or not) & type if present
3. Immediate life safety concerns
4. Significant hazards
5. Changes in the IAP
6. Accountability location

456 Main Street

The First Arriving Response Chief (IC #2)

Where does IC #2 work?

Why does IC # 2 typically work alone?

What factors impact IC #2's mental workload and focus?



Transfer of Command

1. Size-up and verify the current strategy is appropriate.
2. Contact IC #1 for a command transfer.
3. Verify position and function of working companies
4. Get a CAN report.
5. Advise IC #1 you will be taking command.
6. Confirm the command transfer, confirm strategy, and update resource determination as needed.

456 Main Street

How do we implement and maintain the Incident Action Plan?



Communication is Critical



Push to Talk, Not Push to Think!

Standard Content
Standard Format

1-SCBA
CYLINDER
RESERVE AIR
5 MINUTES



Verbal Clarity Requires Intense Practice

General James Mattis

“10-Minute” Training for IC #1

Provide a consistent framework to develop the decision-making skills of company officers and firefighters who may serve as the initial incident commander.

- Pre-Arrival
- Crew Instructions
- Initial Radio Report
- 360° Reconnaissance & Follow Up Radio Report
- Orders to the Second Arriving Company

Along with many other learning opportunities!

“10-Minute” Training for IC #2

Provide a consistent framework to develop the decision-making skills of command officers.

- Pre-Arrival
- Transfer of Command
- Ongoing Incident Management

Along with many other learning opportunities!

“10-Minute” Training

Video provides only one view of the incident and frequently does not provide context...

- Map (including water supply)
- Aerial Photographs
- View of the Building (all sides) Prior to the Incident
- Video Capture (arrival)
- Other Incident Photos
- Post Incident Photos



Authors: Chief Ed Hartin
Validated by:

Training Code: TBD
Training Hours: 0.2

Purpose

The first will be a standard 10-Minute Training addressing the actions of the first two companies. Subsequent 10-Minute Trainings in the series will examine commercial building forcible entry and strategic shift.

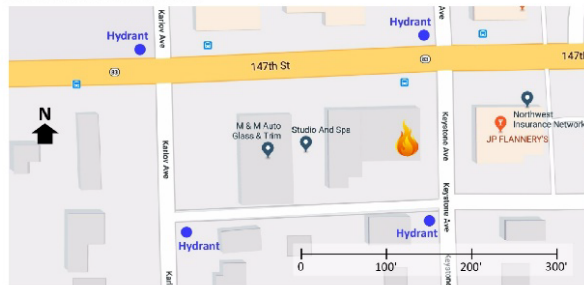
Learning Outcomes

Firefighters and The incident video used in this week's 10-Minute Training will serve as the basis for a series of training sessions. Officers make effective tactical decisions based on current and potential fire behavior and structural stability.

Conducting the Drill

This incident involved a fire in a small, 1-story commercial at 4031 147th Street, Midlothian, Illinois on November 26, 2017 at 23:30. Review the map and photos (Figures 1-8) to gain an understanding of area and building involved.

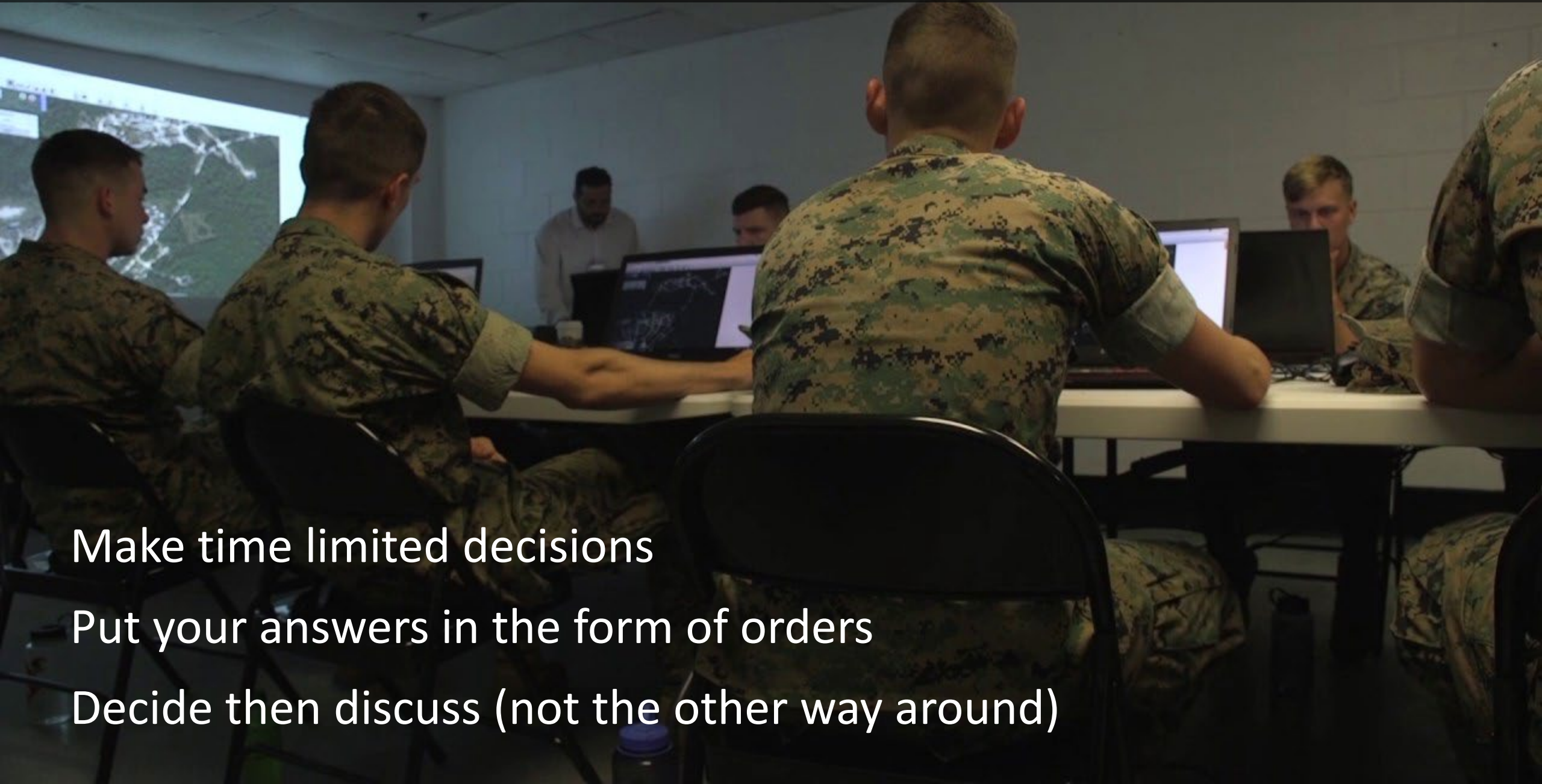
Figure 1. Map of the Incident Area



Note: Adapted from [Google map 4031 147th Street, Midlothian, IL] <https://goo.gl/4U5uJM>

As illustrated in Figure 1, there are hydrants on 147th Street at Karlov Avenue and Keystone Avenue and on Karlov and Keystone Avenues at the alley running behind the fire building.

Inspiration – USMC Tactical Decision Games



Make time limited decisions

Put your answers in the form of orders

Decide then discuss (not the other way around)

“10-Minute” Training

Size-up begins before the alarm, but the process of command becomes more focused as you are dispatched:

- Critical factors considered during response?
- Pre-arrival conversations and assignments?

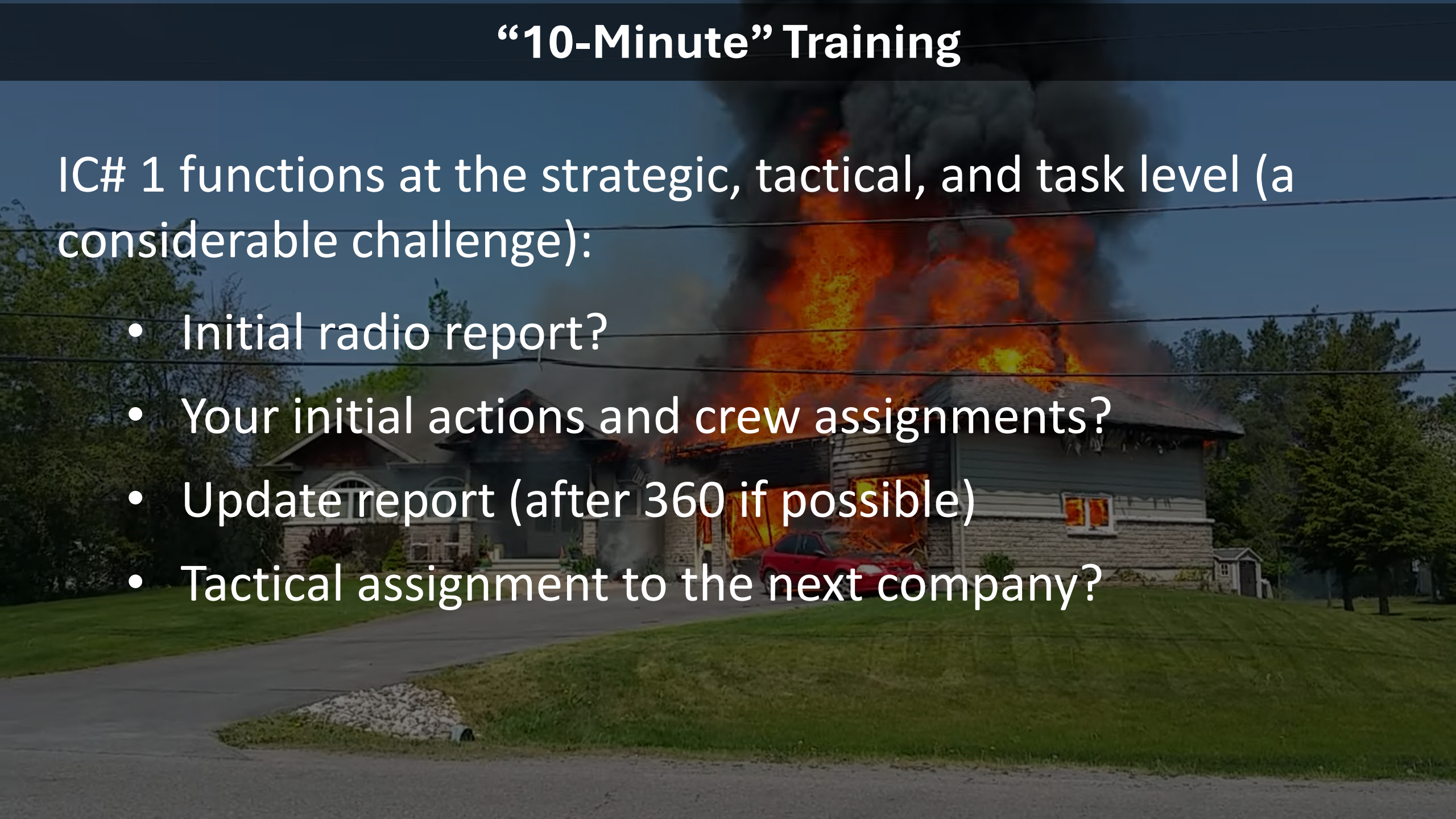
Pilots use the concept of the *sterile cockpit* rule during critical phases of flight.



“10-Minute” Training

IC# 1 functions at the strategic, tactical, and task level (a considerable challenge):

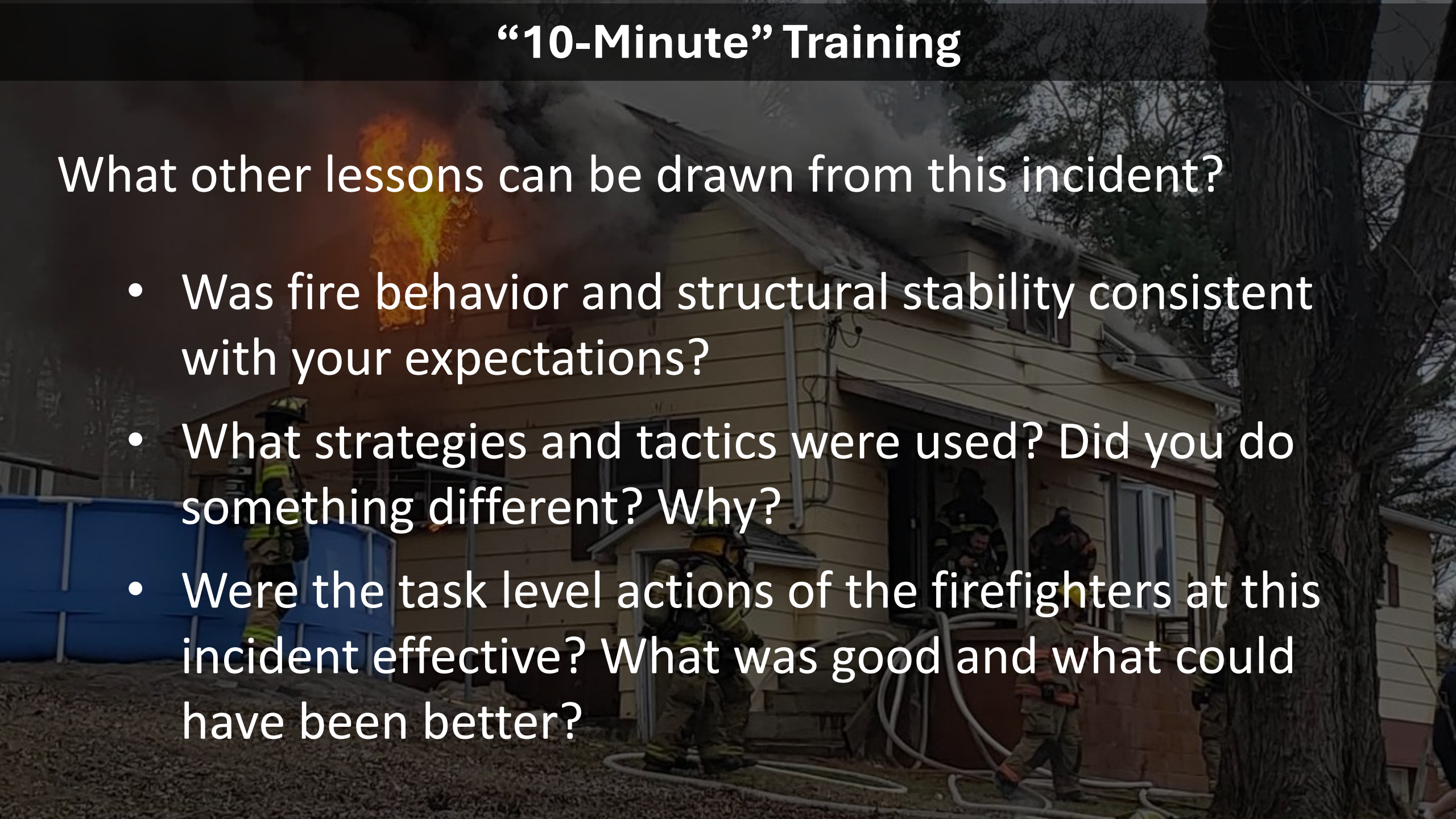
- Initial radio report?
- Your initial actions and crew assignments?
- Update report (after 360 if possible)
- Tactical assignment to the next company?



“10-Minute” Training

What other lessons can be drawn from this incident?

- Was fire behavior and structural stability consistent with your expectations?
- What strategies and tactics were used? Did you do something different? Why?
- Were the task level actions of the firefighters at this incident effective? What was good and what could have been better?





Tactical Decision Games



IC #2

Get Weekly TDGs



Subscribe Today

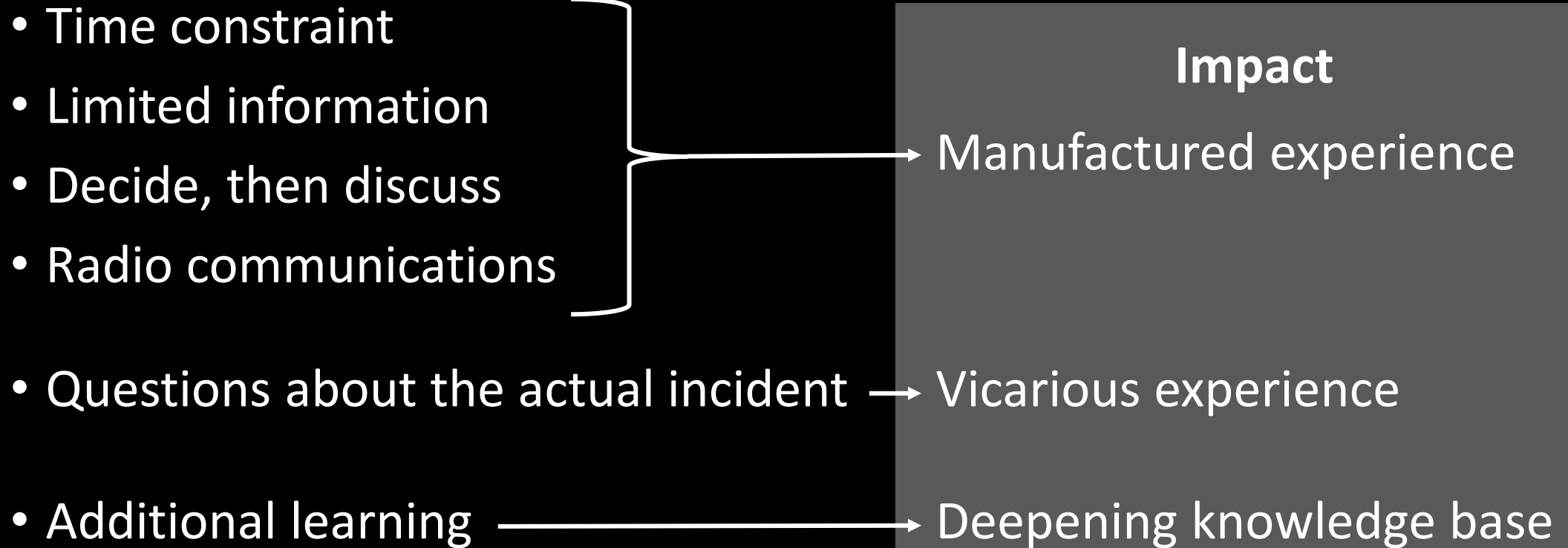
IC #1



Getting better at making decisions requires making decisions!



Key Concepts





NFPA®

1700

Guide for
Structural Firefighting

2026



Chapter 9 Strategic Considerations

Caveat

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Use of this guide is intended to provide a platform for comparison with international firefighting practices and critical thinking about the content of the guide. This guide or on-line access to all NFPA standards and guides may be purchased at www.nfpa.org.



This provision of the guide makes sense and is applicable in my context.



This provision of the guide may make sense and but would require revision or adaptation to apply in my context.



This provision of the guide does not make sense and is not applicable in my context.

9.2 Purpose

Define key variables in an assessment process to select an initial strategy:

- Offense
- Defense

It is important to understand that size-up, incident factors and risk management principles drive the strategy.

Large Group



9.3 Application

Group 1

Conduct initial and ongoing assessment to:
Choose an initial strategy, evaluate strategic effectiveness, and change strategies when conditions, risk management principles, and actions dictate.

9.3.1 *Positioning and tactics match strategy*

9.3.2 *Offensive strategy objectives*

9.3.3 *Defensive strategy objectives*

9.4 Pre-Arrival Factors

Group 2

Form the basis of the initial strategy and should be continually evaluated during an incident.

- 9.4.1 Existing Reference Materials

- 9.4.2 Computer Aided Dispatch (CAD) Resources

- 9.4.3 Weather Conditions

- 9.4.4 Occupancy Status

- 9.4.5 Time of Day

9.5 Initial Arrival Factors

Group 3

Form the basis of the initial strategy and should be continually evaluated during an incident.

9.5.1 *Size-Up of Overall Conditions on Arrival**

9.5.2 *Initial Arrival Factors*

9.5.3 *Combined Size-Up Pre-Arrival/Arrival*

*Must be continuously evaluated throughout the incident.

9.6 360-Degree Survey

Visual assessment of all sides of the structure to identify critical factors.

9.6.1 *Visual Assessment-All Sides*

9.6.2 *Challenge & Verify Combined Size-Up*

9.6.3 *360° Survey is Extremely Important*

9.6.4 *Focus on Occupants & Fire Control*

9.6.5 *360° Survey Considerations*

9.6.6 *Use of TI During 360° Survey*

Group 4 & 5

9.7 Assessment of Fire Dynamics

Group 1 & 2

Factors observed from the exterior of the structure should be used to determine interior conditions.

9.7.1 Smoke & Fire Conditions

9.7.2 Fuel Load

9.7.3 Openings

9.7.4 Flow Path

9.7 Assessment of Fire Dynamics

Group 3 & 4

9.7.5 Weather Conditions

9.7.6 Accessibility of the Structure

9.7.7 Fire Protection

9.7.8 Fire Control Positions

9.8 Risk Management Plan

Risk management for any incident is determined based on the size-up and critical fireground factors as assessed by the initial arriving incident commander.

Large Group

NFPA 1550 10.4.2.1*

The concept of risk management shall be utilized on the basis of the following principles:

- (1) Activities that present a **significant risk** to the safety of members shall be limited to situations where there is a potential to save endangered lives.
- (2) Activities that are routinely employed to protect property shall be recognized as **inherent risks** to the safety of members, and actions shall be taken to reduce or avoid these risks.
- (3) **No risk** to the safety of members shall be acceptable when there is no possibility to save lives or property.
- (4) **In situations where the risk to fire department members is excessive, activities shall be limited to defensive operations.**

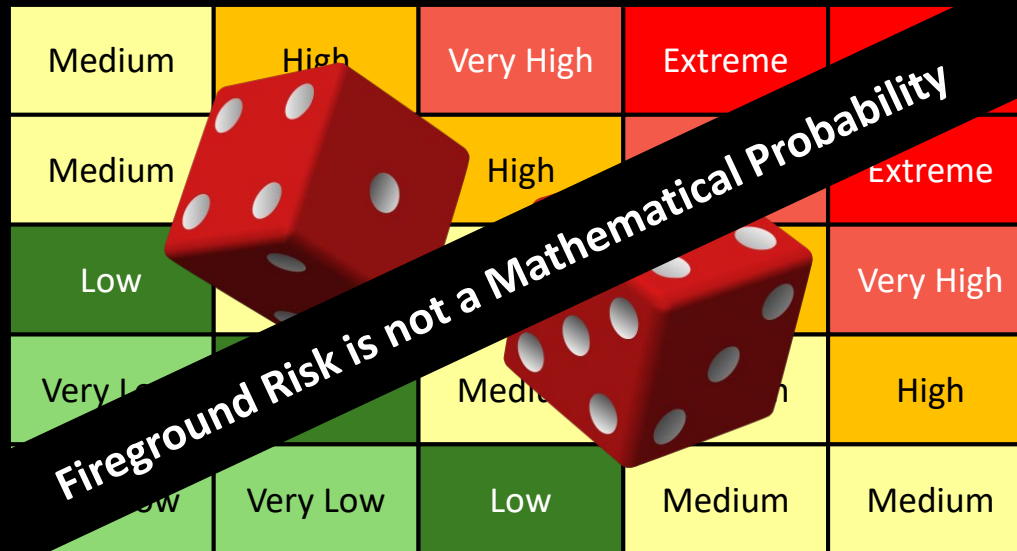
NFPA 1550 A.10.4.2.1

When considering risk management, fire departments should consider the following Rules of Engagement after evaluating the survival profile of any victims in the involved compartment:

- (1) We will risk our lives **a LOT**, in a **calculated manner**, to save **SAVABLE LIVES**.
- (2) We will risk our lives **a LITTLE**, in a **calculated manner**, to save SAVABLE property.
- (3) We **WILL NOT risk our lives at all** for a building or lives that are **already lost**.

Risk Management is about the Why!

A **hazard** is anything that could cause harm.



Risk is a combination of probability and severity of harm from a hazard.

We operate in a deliberate and calculated manner!

- **We will not risk the lives of our members for lives or property that is already lost.**
- **We will accept limited risk to save savable property.**
- **We will accept a greater level of risk to protect savable lives.**



What Does this Really Mean?

Will not risk our lives at all.

What is “zero” risk?

Will risk our lives a little.

What is a “little” risk?

For savable property.

What is “savable”?

Will risk our lives a lot.

What is “a lot”?

To save savable lives.

What determines “savable”?

In a calculated manner.

How is risk vs benefit “calculated”?



Chief Alan Brunacini



LT Nick Ledin

9.9 Identification of Strategy

Group 3

9.9.1 *Consider the Entirety of Available Information**

9.9.2 *Ability to Extinguish the Fire*

9.9.3 *Accessibility and Fire Control Positioning*

Strategy must be continuously evaluated throughout the incident.

9.10 Strategic Decision

Group 4

9.10.1 *Use Size-Up Factors, Extinguishment & Search Tactics to Determine Strategy*

9.10.2 *Ability to Control Fire Conditions in Conjunction with Locating Occupants*

9.10.3 *In offense, base fire attack on capability to extinguish the fire and search the interior.*

9.10.4 *In defense conduct fire control actions from the safest, most effective positions outside of the area already lost.*

9.11 Incident Action Plan

An appropriate IAP addresses the top five factors contributing to LODD found in NIOSH reports.

Group 5

NIOSH Top 5

Causes of traumatic LODD on the fireground

1. Improper risk assessment.
2. Lack of incident command.
3. Lack of accountability.
4. Inadequate communications.
5. Lack of, or failure to, follow standard operating procedures (SOPs).

We need to know what these five things are. Really know!



9.12 Strategy Implementation

Group 1

9.12.1 *The IC Should Declare the Incident Strategy via Radio (Early)*

9.12.2 *The IC Should Declare Strategic Changes via Radio (As Soon as Possible)*

Out of Class Assignment

Read your group's assigned sections of NFPA 1700.

Watch the YouTube Video
High-Rise Tactics used by
Toronto's High-Rise Unit





Questions?

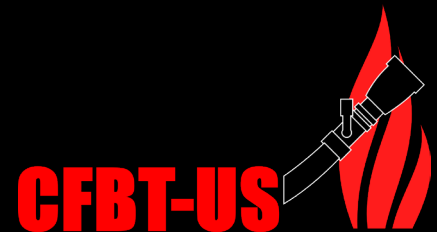
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<https://www.commandcompetence.com>



Strategy, Tactics, and Decision Making for Structural Firefighting



Sensemaking

Practice

Naturalistic
Decision Making

Situational
Awareness

Research

Capabilitie &
Limitations

Day 3

Resources

Fire Dynamics

Strategy

Fire Control

Anti-Ventilation

Ventilation

Search

Tactics





In-Station Training

TM 18-27 Wind Driven Fire



Training Code: TBD
Training Hours: 0.2

Authors: Chief Ed Hartin
Validated by:

Purpose

The wind can be a significant influence on structural fire conditions. Wind may increase the threat to exposures or it can substantially worsen fire conditions on the interior by increasing heat release rate and gas velocity in the flow path. This week's 10-Minute Training examines a residential fire in Belgium. Despite this fire occurring in a different country half way around the world there are several elements (fire behavior, access challenges, etc.) that are common to our operational environment.

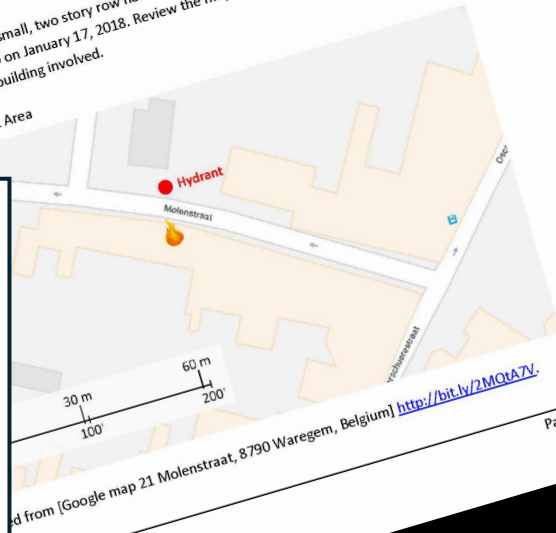
Learning Outcomes

Firefighters and Officer recognize the effects of wind on structure fires and safely and effectively apply appropriate tactics.

Conducting the Drill

This incident involved a fire in a small, two story row house at 21 Molenstraat, 8790 Waregem in Belgium at approximately 13:30 on January 17, 2018. Review the map and photos (Figures 1-4) to gain an understanding of area and building involved.

Figure 1. Map of the Incident Area



Residential Fire
21 Molenstraat
8790 Waregem,
Belgium
January 17, 2018





Hydrant

Molenstraat

Oscar Verschuerestraat

30 m

60 m

100'

200'



Hydrant

Molenstraat



Exposure
Delta 1

Alley Access
to Side Charlie

Exposure
Bravo 1

Exposure
Bravo 1

Fire
Occupancy



Exposure
Bravo 1

Alley

Fire
Occupancy

Exposure
Delta 1



Exposure
Bravo 1

Fire
Occupancy

Exposure
Delta 1



What critical factors would you consider?

What conversations would you have with your crew during response?

What do you anticipate finding on arrival?



A photograph of a residential street with a row of brick houses. Thick white smoke is rising from the roofline of one of the houses, indicating a fire. In the foreground, the tops of several cars are visible. The text is overlaid on the image in a large, white, sans-serif font.

Initial radio report exactly as you
would transmit it?

What specific actions will you take?

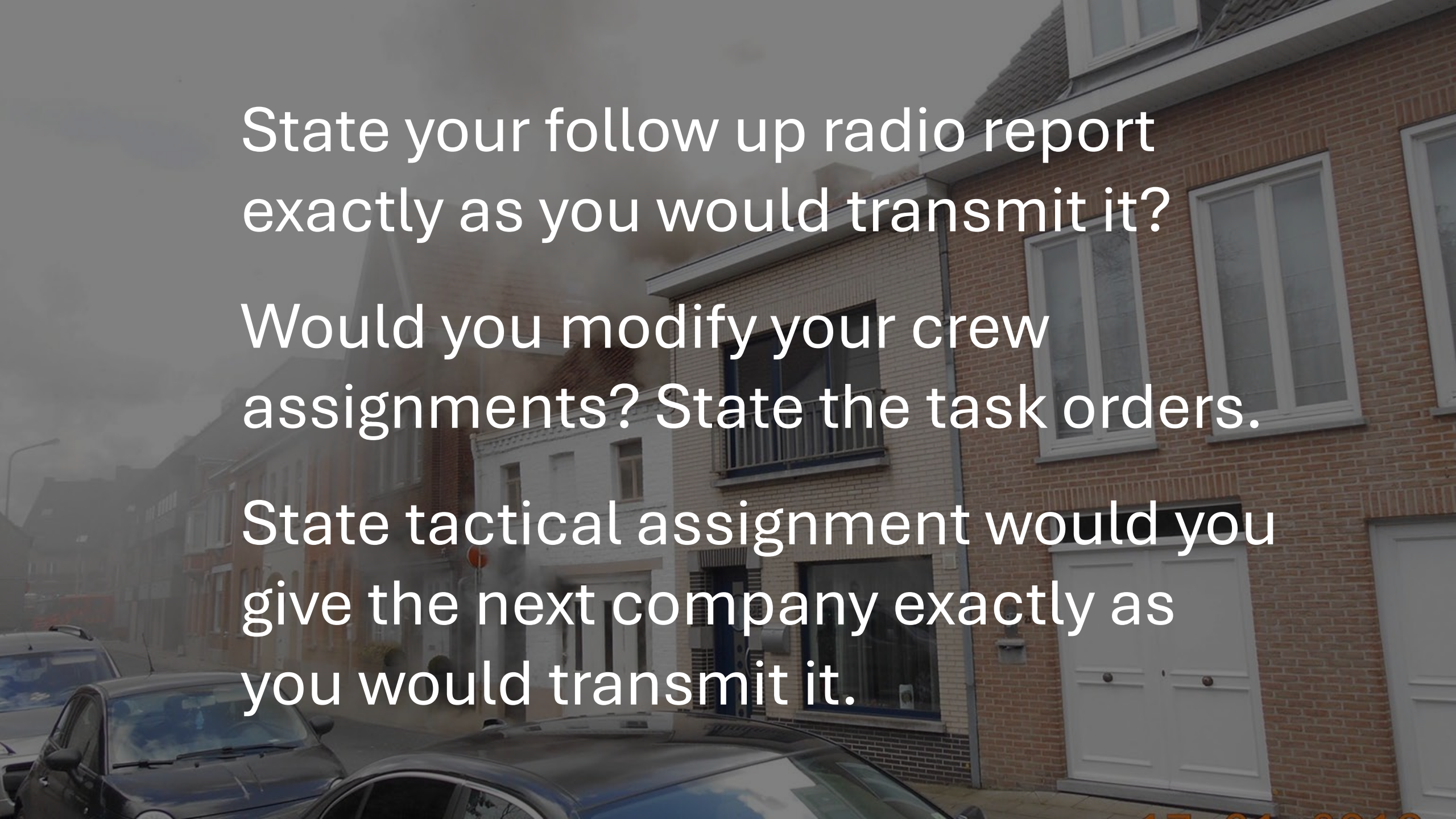


Exposure
Delta 1

Fire
Occupancy

Alley Access
to Side Charlie

Exposure
Bravo 1



State your follow up radio report exactly as you would transmit it?

Would you modify your crew assignments? State the task orders.

State tactical assignment would you give the next company exactly as you would transmit it.

A photograph of a row of brick houses on a street. Thick white smoke is rising from the ground in front of one of the houses, partially obscuring the view. Several cars are parked along the street in the foreground. The text is overlaid on the left side of the image.

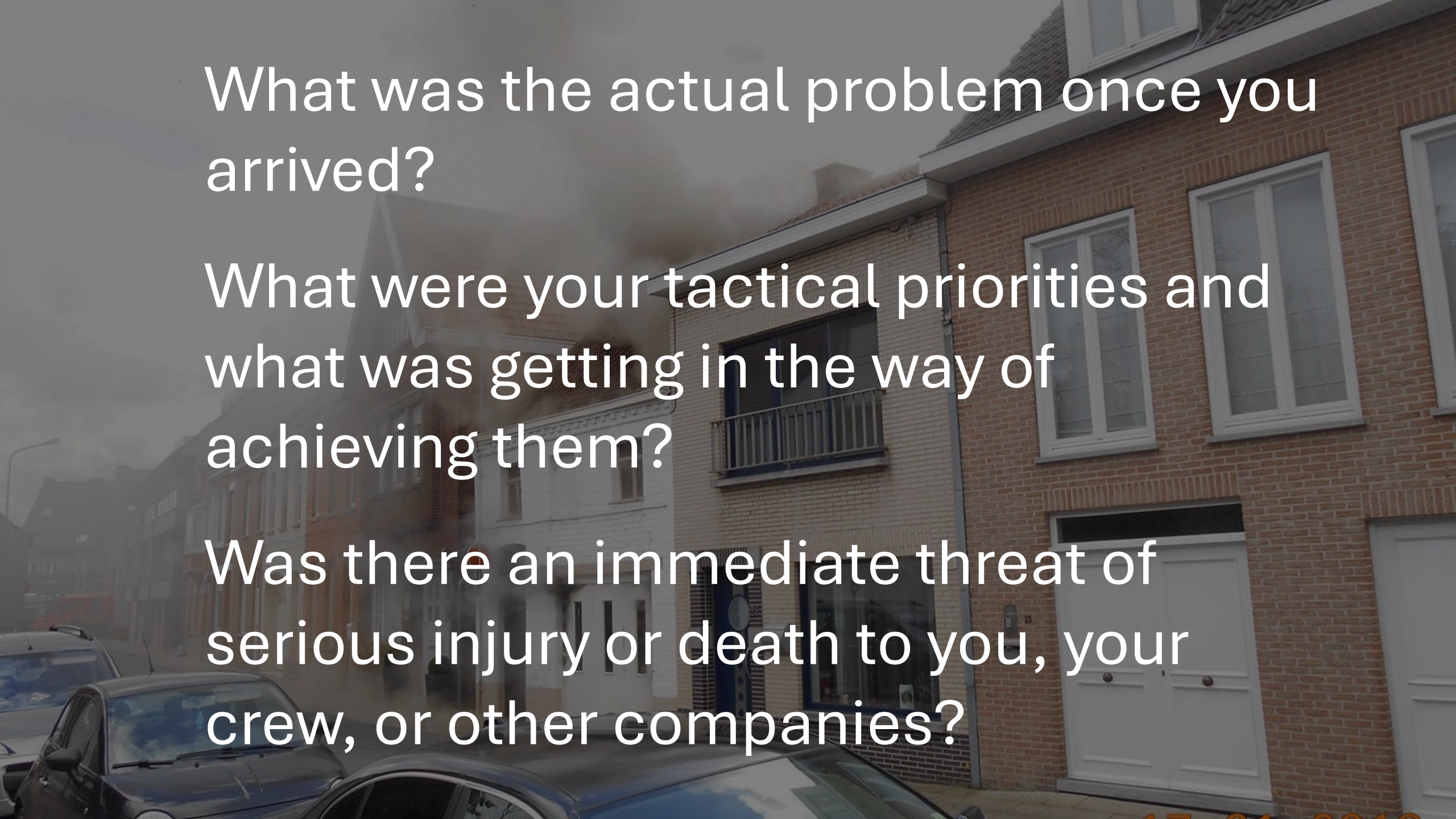
State your conditions, actions, and needs (CAN) report to the first arriving command officer as part of command transfer to IC #2*.

*Based on anticipated effectiveness.



What information most influenced your expectations?

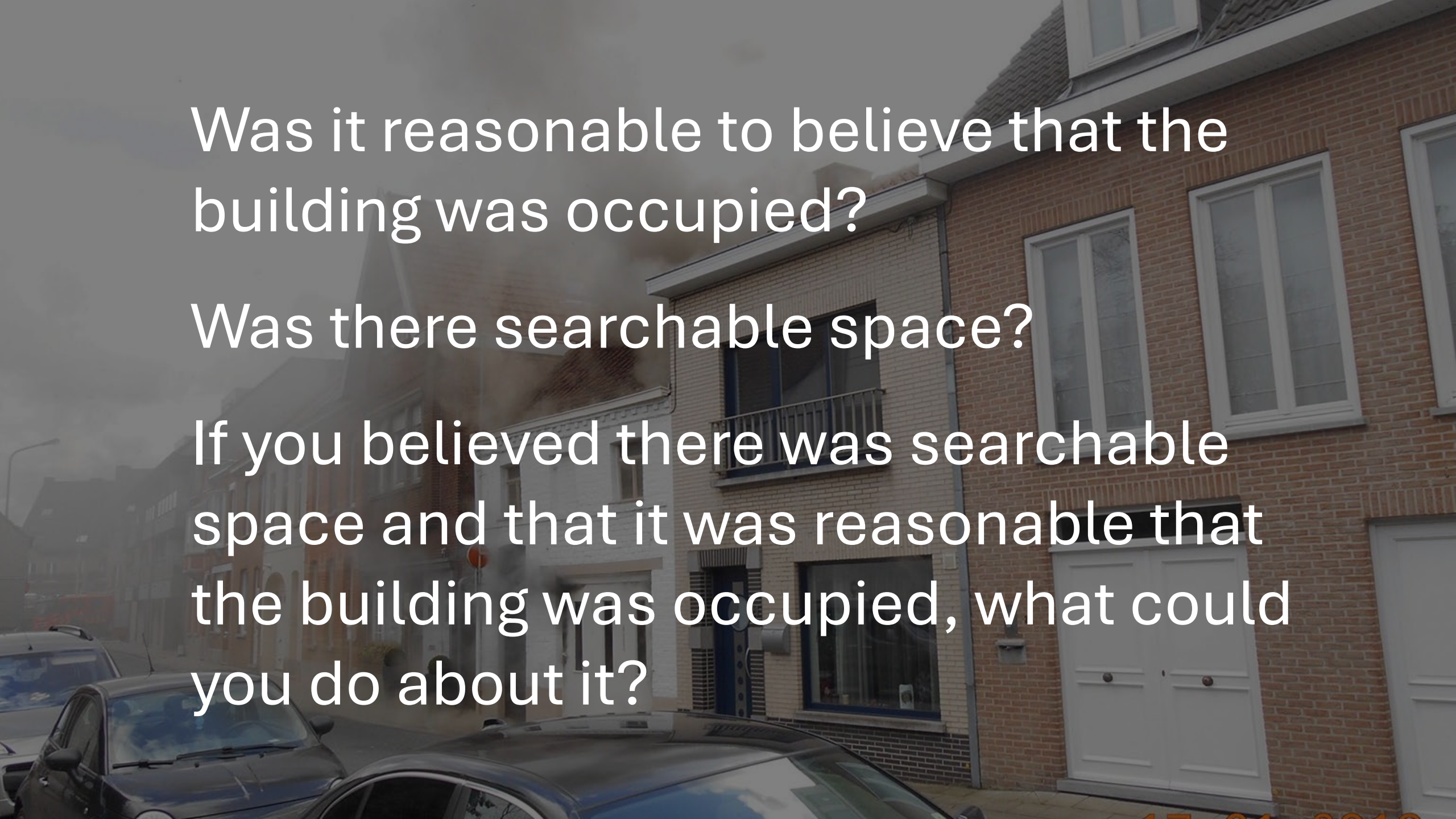
Did anything in the incident post-arrival challenge your initial expectations?

A photograph of a residential street. In the foreground, there are several cars parked. The background features a row of brick buildings. One building has a balcony. A plume of smoke is visible rising from behind the buildings, suggesting a fire. The text is overlaid on the left side of the image.

What was the actual problem once you arrived?

What were your tactical priorities and what was getting in the way of achieving them?

Was there an immediate threat of serious injury or death to you, your crew, or other companies?

A photograph of a residential street featuring a row of brick houses. The houses have white-framed windows and doors. Several cars are parked along the street in the foreground. The image is slightly faded to serve as a background for the text.

Was it reasonable to believe that the building was occupied?

Was there searchable space?

If you believed there was searchable space and that it was reasonable that the building was occupied, what could you do about it?

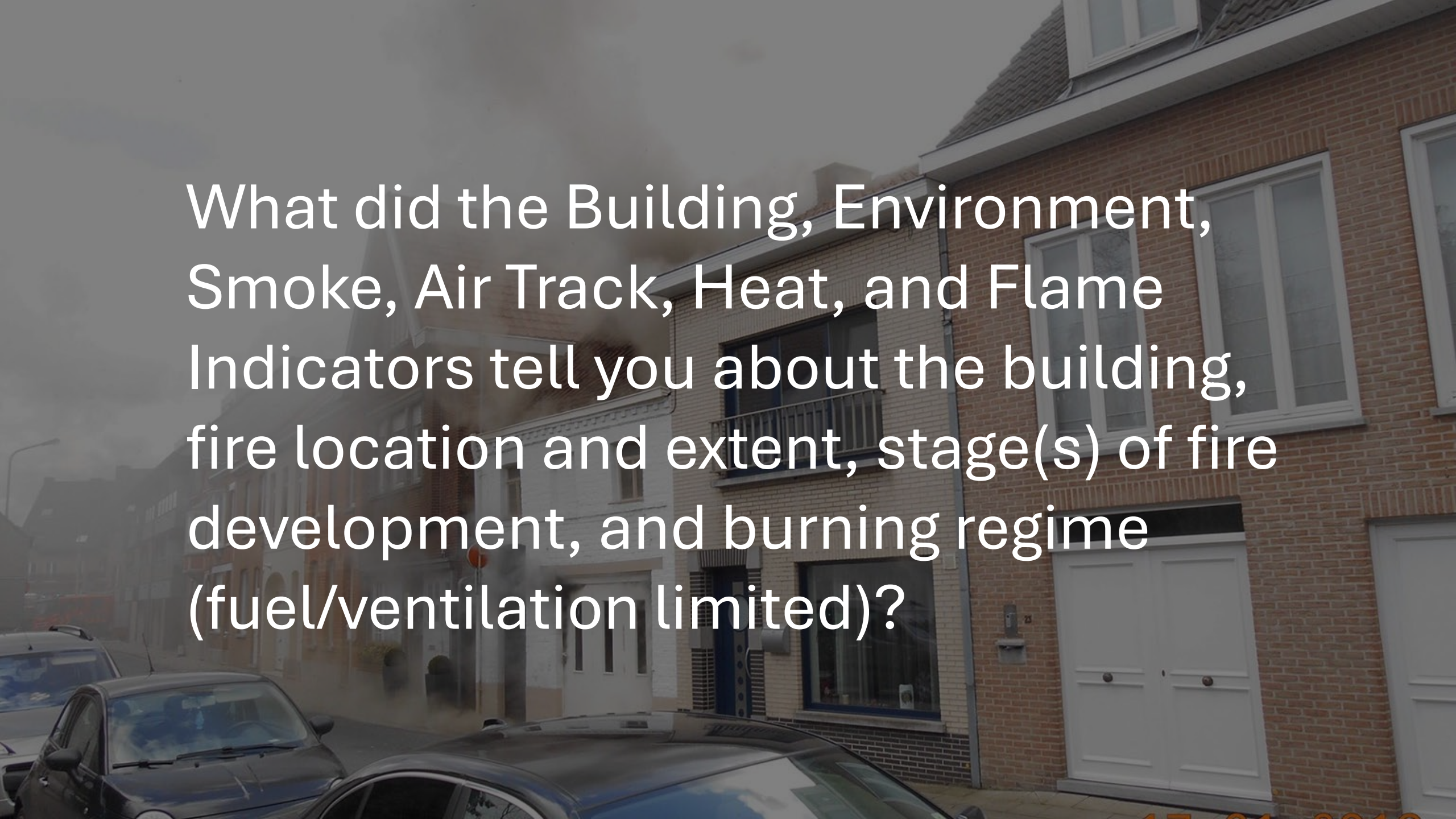


Mute

-1:47

How would closing the front door at the point have impacted fire conditions?
If you lost control of the door and had hot smoke exiting at high velocity, how could you regain control of the door and establish door control?



A photograph of a row of brick houses on a street. Thick white smoke is rising from the roofline of one of the houses, indicating a fire. Several cars are parked along the street in the foreground. The text is overlaid on the image in a large, white, sans-serif font.

What did the Building, Environment,
Smoke, Air Track, Heat, and Flame
Indicators tell you about the building,
fire location and extent, stage(s) of fire
development, and burning regime
(fuel/ventilation limited)?



Mute

-1:47

How did the BE-SAHF indicators change after the door was opened?

What does this additional information tell you about fire conditions?

NFPA®

1700

Guide for
Structural Firefighting

2026



Chapter 10 Fire Control (Water & Air)

Caveat

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Use of this guide is intended to provide a platform for comparison with international firefighting practices and critical thinking about the content of the guide. This guide or on-line access to all NFPA standards and guides may be purchased at www.nfpa.org.



This provision of the guide makes sense and is applicable in my context.



This provision of the guide may make sense and but would require revision or adaptation to apply in my context.



This provision of the guide does not make sense and is not applicable in my context.

Tactical Considerations

- An evidence-based concept for the fire service to consider implementing into their department to enhance efficiency, effectiveness, and increase knowledge to accomplish their mission.
- Are meant to inform, not replace local standard operating procedures. Each situation is unique, requiring different tactical choices to achieve the incident priorities.
- A tactical consideration is not policy. It is not a specification on how to enact or carry out a specific tactic.

Preferred Technique

A technique that has shown to be *mostly* effective, in *most* environments or with *most* of the potential variables. There are certainly potential outliers based the variables, it would seem to me.

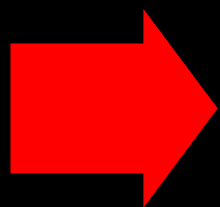
This concept makes me think about discussing “standard conditions” for a given fire condition and/or structure and then describing the “standard actions” that are likely to be the “preferred technique(s)” based on research, experience, and/or training.

Deputy Chief Chris Stewart

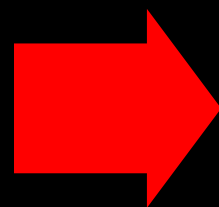
NFPA 1700 Committee Member & Blue Card Lead Instructor



**Standard
Conditions**



**Standard
Actions**



**Standard
Outcomes**

10.2 Purpose

The purpose of this chapter is to provide guidance on fire control and extinguishment options for tactical consideration.

10.3 Application

The intent of this chapter is for firefighting personnel to apply science-based tactical considerations for fire control and extinguishment.

Large Group



10.4 General

Group 1

10.4.1 *The primary fireground mission is life safety. Fire control, search, and ventilation/nonventilation become primary tactical objectives.*

10.4.2 *Coordination means that crews operating on the fireground are working together.*

10.4.3 *Fireground tactics and tasks should be driven by critical fireground factors, risk management, strategy, and resource capacity,*

10.4 General

Group 2

10.4.4 *Impact of closed vs open doors on occupant survivability.*

10.4.5 *Importance of early removal of trapped occupants.*

10.4.6 *The tactical options provided herein may be viewed as an algorithm (i.e., a set of instructions) to solve specific fire control and extinguishment problems.*

10.4 General

Group 3

10.4.7 Tactical options provided herein only address those tactics associated with water and air.

10.4.8 These templates is not to restrict innovation. The guidance provided rests on the understanding that tactics will evolve.

10.4.9 Tactical options are presented in an order that moves from the outside to the inside of a structure (in terms of water use) and from simple to more complex ventilation (in terms of air).

10.4 General

Group 4

10.4.10 *Coordination of operational practices requires clear, direct communication between command and companies or crews assigned to tactical functions.*

10.4.11 *A tactical plan prioritizes the control of dangers. When multiple high-priority tasks must be accomplished sequentially, fire control should be the priority. Rescue is the first strategic priority but not necessarily the first tactical priority.*

10.4.12 *A well-placed hose stream makes things better for occupants and firefighters.*

10.4 General

Group 4

10.4.13 When high-priority tasks can be accomplished simultaneously, it is important to support and protect the rescue or search operations using hose line(s) and flow path management.

10.4.14 Coordination becomes a tactical decision to apply tactical actions sequentially or to undertake tactical actions simultaneously based on resources and capability.

10.5 Water

10.5.1 General

It is important to understand how to optimize the effectiveness of hose streams.

Large Group



10.5 Water

10.5.2 Exposure Control

10.5.3 Exterior Fire Control

Group 1

10.5 Water

10.5.4 Straight Stream or Solid
Bore Interior Advancement

10.5.5 Interior Direct Fire Control

Group 2 & 3

10.5 Water

10.5.4 Straight Stream or Solid
Bore Interior Advancement

10.5.6 Indirect Attack

Group 4 & 5

10.5 Water-What is Not Addressed?





**Ultra-High Pressure
Cutting Extinguisher**

**High Pressure
Fog Nails**

10.6 Air

10.6.1 General

Decisions about when and where ventilation is needed and the method(s) to be employed should be guided by the understanding that air will increase the HRR and potential for rapid fire development in the absence of effective water being applied on a fire.

Nonventilation or Ventilation

Large Group



10.6 Air

10.6.2 Nonventilation

Group 1

10.6 Air

10.6.3 Horizontal Ventilation

Group 2

10.6 Air

10.6.4 Vertical Ventilation

Group 3

10.6 Air

10.6.5 Positive Pressure Attack

10.6.6 Positive Pressure Ventilation

10.6.7 Positive Pressure Isolation

Group 4

10.6 Air

10.6.8 Hydraulic Ventilation

10.6.9 Negative Pressure Ventilation

Group 5

10.7 Alternatives

Alternatives for exterior fire control.

Large Group

10.7 Alternatives

10.7.1 Exterior Control – Basement Fires

Group 1

10.7 Alternatives

Group 2

10.7.2 Exterior Control – Bent Tip [Floor Below] Nozzle

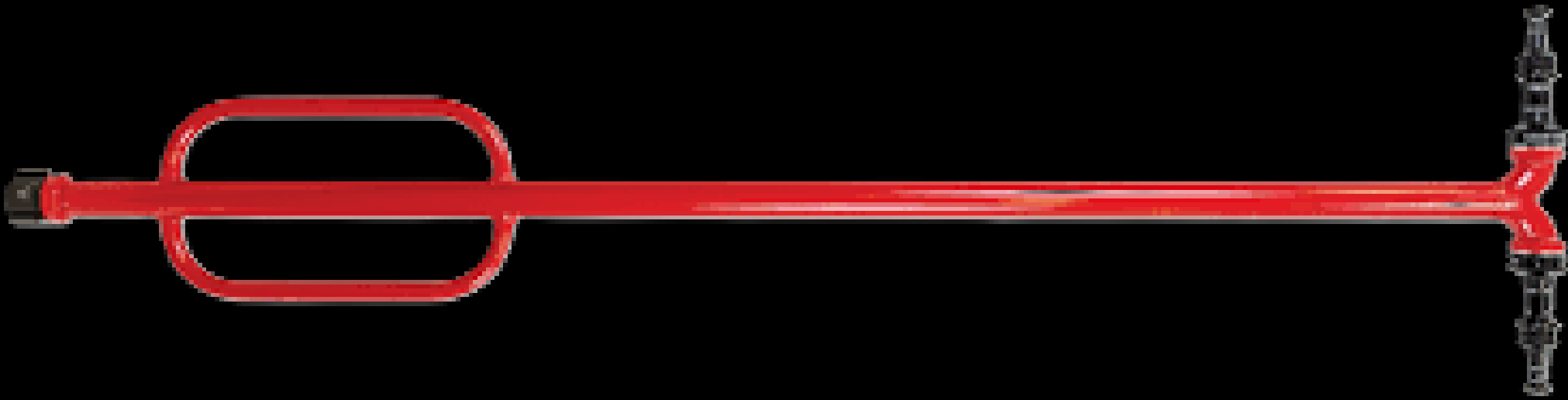


<https://youtu.be/6mR0PmZhQQ?t=337>

10.7 Alternatives

Group 3

10.7.3 Exterior Control – Opposing Tip Nozzle



<https://youtu.be/6mmROPmZhQQ?t=337>

10.7 Alternatives

Group 4

10.7.4 Exterior Control – Rotary Distributor Elevating Apparatus



10.7 Alternatives

Group 5

10.7.5 Exterior Control – Rotary Distributor Internal High-Rise Application



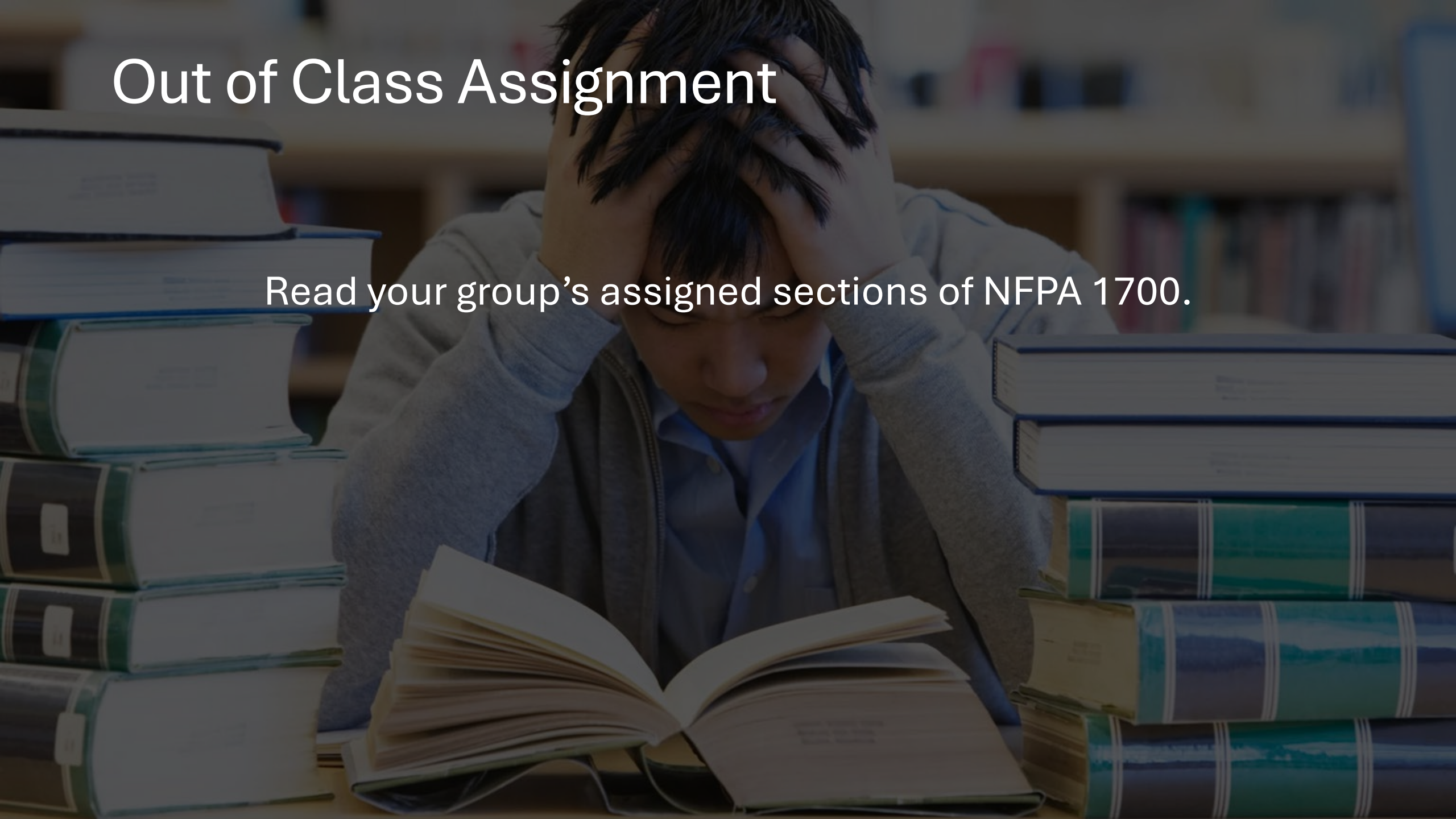
<https://youtu.be/6mmROPmZhQQ?t=337>

Synthesize research on
what works, for whom,
and in what
circumstances

Obtain and document
implementation
experiences and
lessons learned

Integrate and translate
synthesized research
and implementation
experiences to inform
policy, procedure, and
operations

Out of Class Assignment

A young man with dark hair is sitting at a desk, looking down at an open book. He has his hands pressed against his temples, suggesting stress or frustration. He is wearing a grey zip-up hoodie over a light blue button-down shirt. The desk is cluttered with several large stacks of books on both sides of the open book. The background is a blurred library or study area with bookshelves filled with books.

Read your group's assigned sections of NFPA 1700.



Questions?

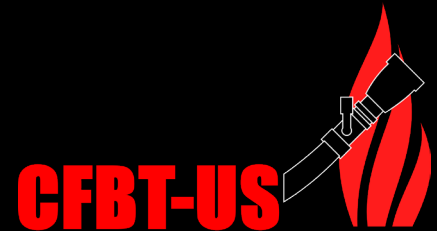
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Strategy, Tactics, and Decision Making for Structural Firefighting



Sensemaking

Practice

Naturalistic
Decision Making

Situational
Awareness

Research

Capabilitie &
Limitations



Resources

Fire Dynamics

Strategy

Fire Control

Anti-Ventilation

Ventilation

Search

Tactics

CFBT-BE

Niet alleen wat en hoe, maar waasrom!



Command Function #7

Review, Evaluation and Revision



Command Function #7

Major Goal:

To confirm that the current IAP is meeting the tactical requirements of the incident and adequately provides for the safety of the workers while identifying and addressing any areas that are not covered





Add Several Case Studies

- La Grange
- Cobb County



Address Issues Identified
in the First 3 Days

- Accountability
- Communications



TDGs IC #1 & #2

*NFPA 1700-Search
Discussion*



?

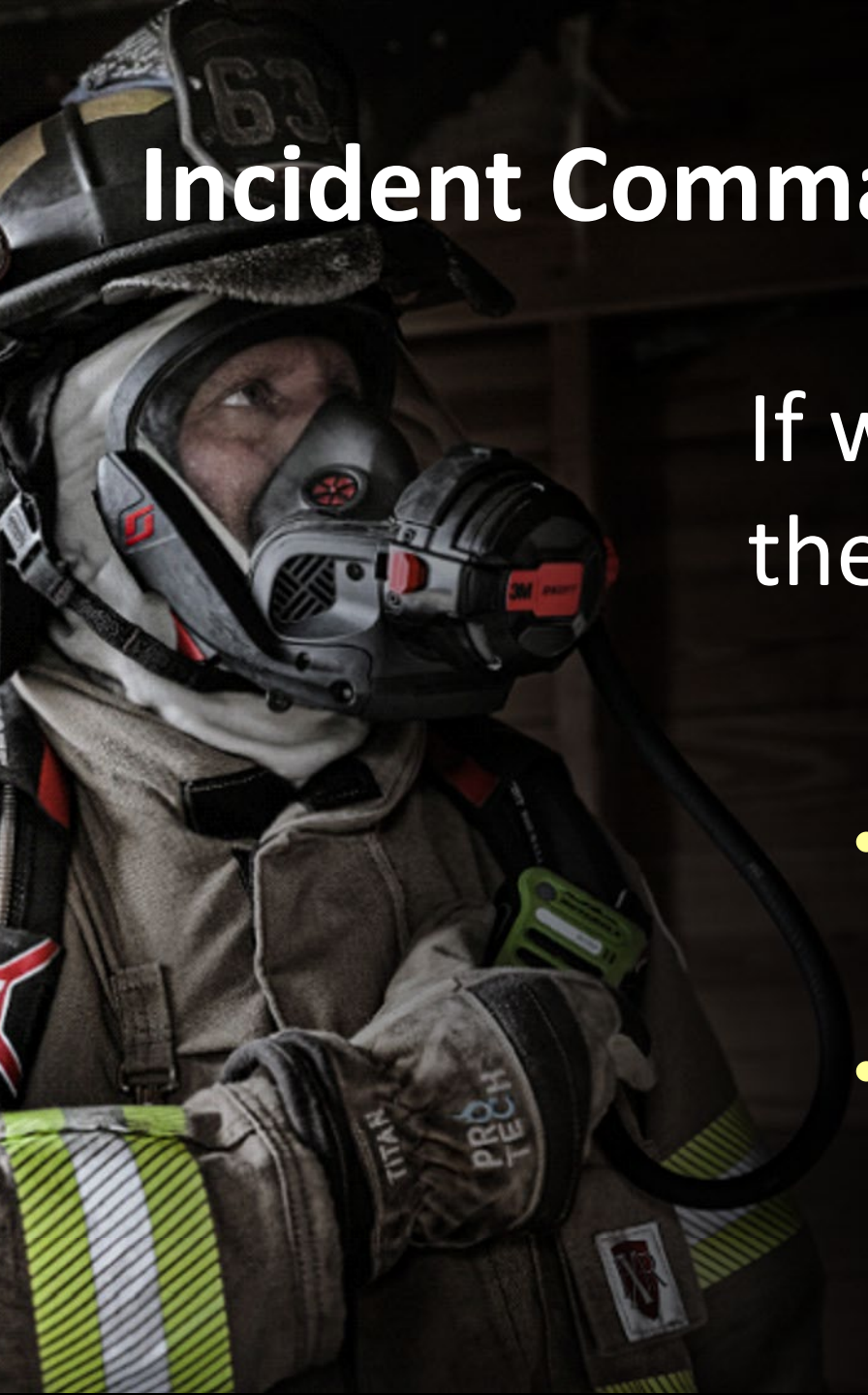


Accountability Model



1. Establish standards/best practices
2. Train to those standards/practices
3. Monitor performance
4. Manage accountability (to each other)

Leaders need to focus on trust in resolving issues!



Incident Command & Effective Communication

If we could just shut up when we get there, we could get a lot more done!

- How are effective communications connected to positive incident outcomes?
- How are effective communications connected to safe incident operations?

What are we communicating?
Who are we communicating with?



Common Language is Important!



Using the order model reduces radio traffic, enhances accountability, reduces deployment and location errors, and aids in reducing freelancing

2nd Law of Combat: Simple (Joko Willink & Leif Babin)
Keep communications simple, clear, and concise (this takes practice).

Push to Talk, Not Push to Think!

**Standard Content
Standard Format**



Standard Communication Process

- Standard IRR & Follow Up
- Standard assignments (TLO)
- Standard transfer of command
- Standard progress reports (IC driven CAN)
- Standard priority/emergency traffic/mayday



Initial Radio Report

A photograph of a two-story house with light-colored siding and a brown roof. Thick, dark smoke is billowing from the roofline, partially obscuring the upper part of the house. The scene is set in a residential area with a lawn and some shrubs in the foreground.

1. Size
2. Height
3. Occupancy
4. Conditions
5. Initial Incident Action Plan
6. Strategy
7. Initiate & Name Command
8. Resource Determination

456 Main Street

Update Report

Results of the 360, including:

1. Stories on other than Side Alpha
2. Basement (or not) & type if present
3. Immediate life safety concerns
4. Significant hazards
5. Changes in the IAP
6. Accountability location

456 Main Street

Transfer of Command

1. Size-up and verify the current strategy is appropriate.
2. Contact IC #1 for a command transfer.
3. Verify position and function of working companies
4. Get a CAN report.
5. Advise IC #1 you will be taking command.
6. Confirm the command transfer, confirm strategy, and update resource determination as needed.

456 Main Street

Effective Communications

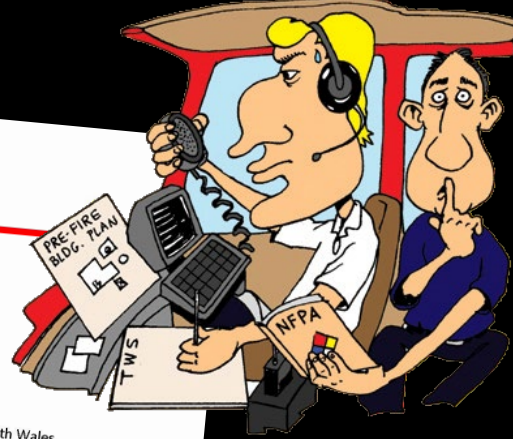


- Improved situational awareness.
- Improved operational effectiveness.
- Increased likelihood of hearing a mayday.



Verbal Clarity Requires Intense Practice

General James Mattis



Commercial Fire 11 Maroubra Rd, Sydney, New South Wales, Australia September 25, 2025



In-Station Training TM 26-08a Commercial Fire

Author
Chief Ed Hartin

Purpose
This 10-Minute Training for IC#2 is a bit different than usual. It is set in Sydney, New South Wales, Australia and resources and water supply are based on the actual Fire Rescue New South Wales incident.

Learning Outcomes
Command officers perform effective ongoing size-up; select an appropriate strategy, and implement tactics based on the strategic decision-making model.

Conducting the Drill
This incident involved a commercial fire at the Foam Laundromat, 11 Maroubra Rd, Sydney, New South Wales, Australia on Thursday, September 25, 2025, at 20:55 (Emergency NSW, 2025 & 9 News Sydney, 2025). Review the map and photos (Figures 1-6) to gain an understanding of the buildings and area involved.

Figure 1. Map of the Incident Area



from Google. (2026a). [Map, 11 Maroubra Rd, Sydr
bit.ly/4ayd0r4.

Not just what and how, but why

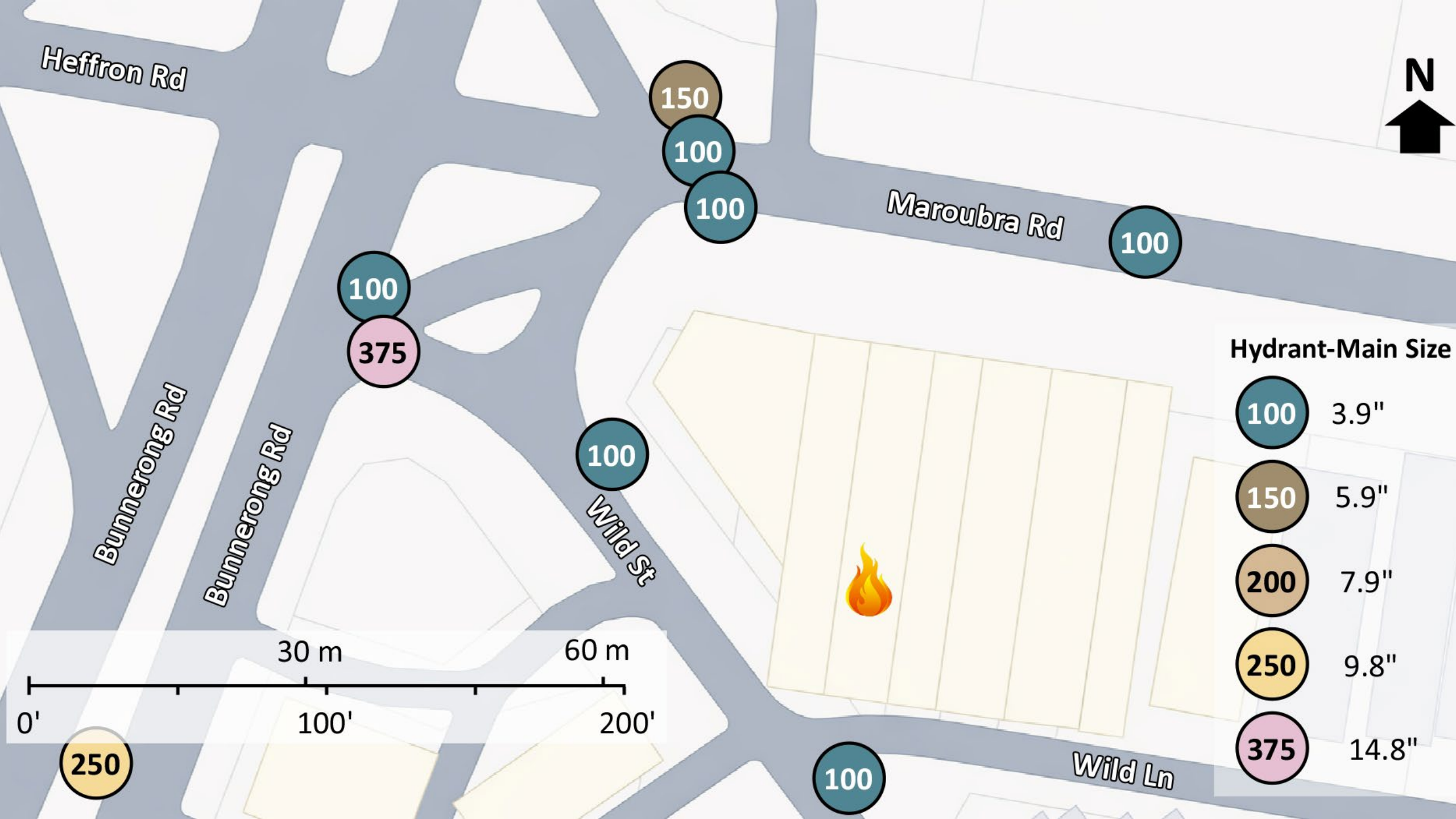
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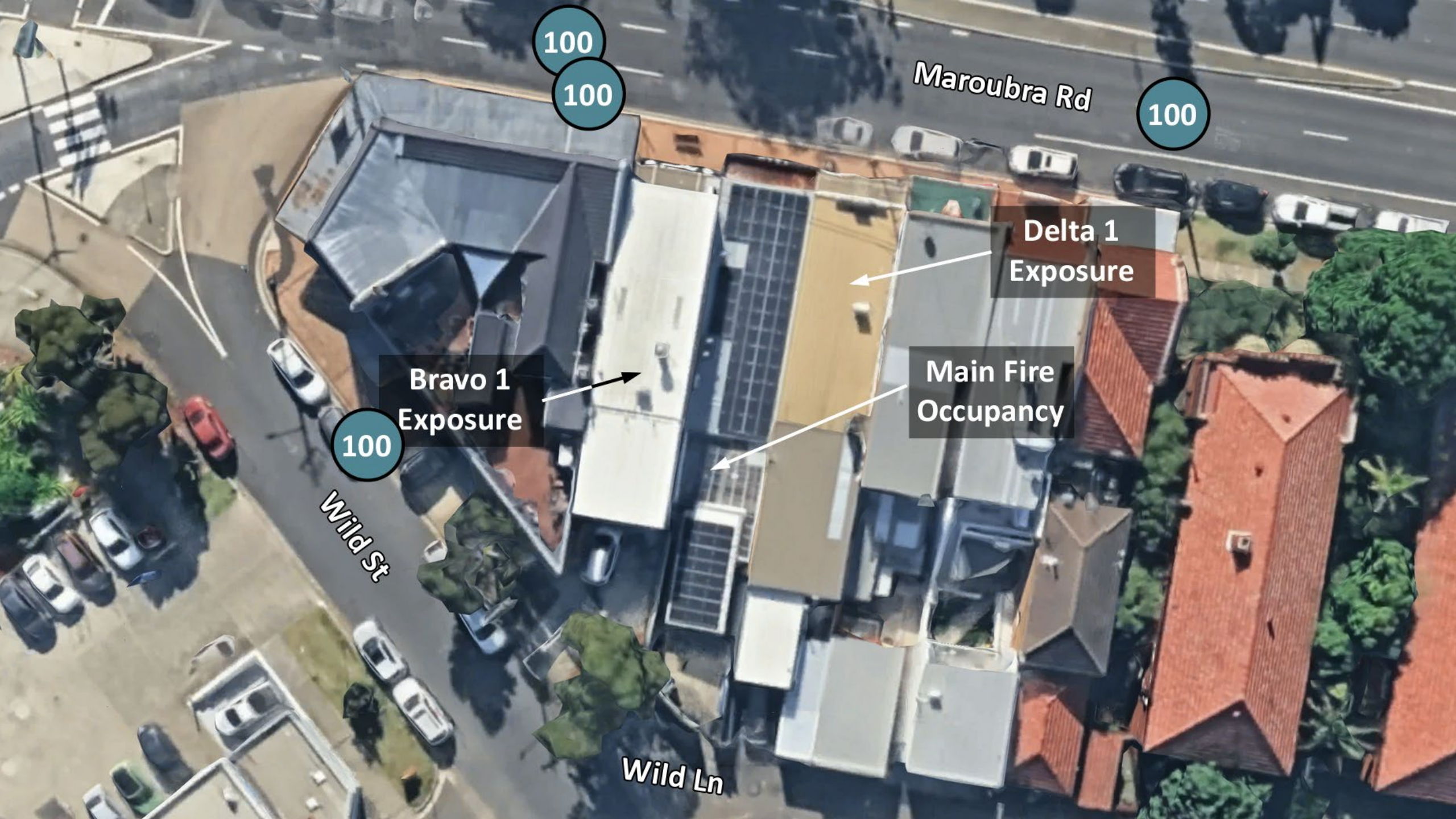
Learning Outcomes
Initial incident command tactics based on the strategic decision-making model.

Conducting the Drill
This incident involved a commercial fire at the Foam Laundromat, 11 Maroubra Rd, Sydney, New South Wales, Australia on Thursday, September 25, 2025, at 20:55 (Emergency NSW, 2025 & 9 News Sydney, 2025). Review the map and photos (Figures 1-6) to gain an understanding of the buildings and area involved.

Figure 1. Map of the Incident Area







100

100

Maroubra Rd

100

Delta 1
Exposure

Bravo 1
Exposure

100

Wild St

Main Fire
Occupancy

Wild Ln





Bravo 1
Exposure

Main Fire
Occupancy

Delta 1
Exposure

FOAM
LAUNDRY LOUNGE

PIZZA NINROUBRA 3344 4455

Pizzeria

BBQ MASTER
OMEN & DELIVERY
111 4444 4444
111 4444 4444

PIZZA - PASTA - DRINKS
PIZZA - PASTA - DRINKS
PIZZA - PASTA - DRINKS

PIZZA - PASTA - DRINKS
PIZZA - PASTA - DRINKS
PIZZA - PASTA - DRINKS

**Delta 1
Exposure**

**Main Fire
Occupancy**



Main Fire
Occupancy

Bravo 1
Exposure





What critical factors would you consider?

What conversations would you have with your crew during response?

What do you anticipate finding on arrival?





Initial radio report exactly as you
would transmit it?

What specific actions will you take?



State your follow up radio report exactly as you would transmit it?

Would you modify your crew assignments? State the task orders.

State tactical assignment would you give the 2nd arriving engine/pump exactly as you would transmit it.



State tactical assignment would you give the 3rd arriving engine/pump exactly as you would transmit it.

State your conditions, actions, and needs (CAN) report to the first arriving command officer as part of command transfer to IC #2*.

*Based on anticipated effectiveness.



What information most influenced your expectations?

Did anything in the incident post-arrival challenge your initial expectations?



What was the actual problem once you arrived?

What were your tactical priorities and what was getting in the way of achieving them?

Was there an immediate threat of serious injury or death to you, your crew, or other companies?



Was it reasonable to believe that the building was occupied?

Was there searchable space?

If you believed there was searchable space and that it was reasonable that the building was occupied, what could you do about it?



Watch the [incident video](#) (Emergency NSW, 2025) from 00:15 to 02:20 illustrating actual incident conditions

This video begins with operations being conducted on Side Charlie and then progresses to Side Alpha.





The initial IC implemented a defensive strategy. Was this consistent with your incident action plan? What factors influenced your strategic choice?



Did you identify a need for primary search and checking for extension in the adjacent occupancies?

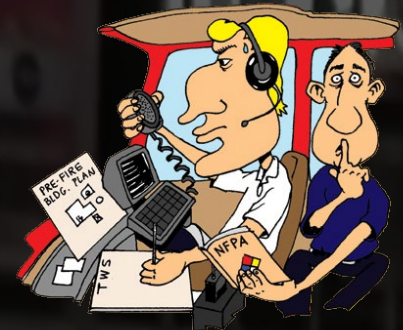
If so, what critical factors influenced identification of this need?

What action did you take to address it (e.g., tactical assignment or needs stated in transfer of command)?



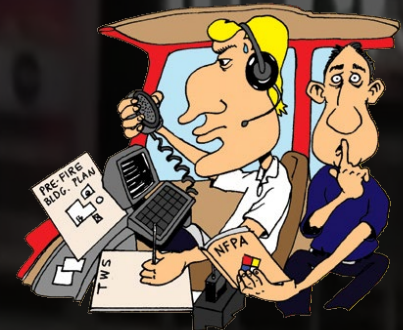
While you are responding, you hear Engine 3, Engine 4, Platform 4, and Engine 5 go enroute.

What critical factors would you consider when dispatched and during response?



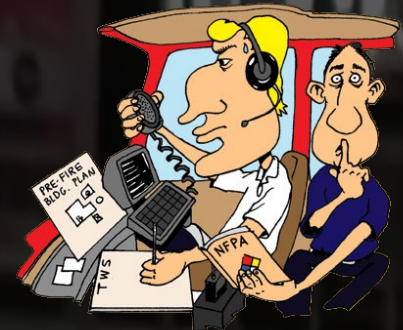
Maroubra Command provides the following follow-up report:

No 360 due to size, the fire appears to be in the rear of the laundromat towards Side Charlie. Bravo 1 is a one-story commercial and Delta 1 is a two-story commercial.



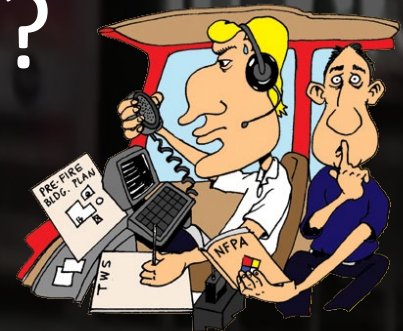
Engine 2 arrives and reports that they are Level 1 on Maroubra Road at Wild Street. Maroubra Command provides the following tactical assignment:

Position on Side Charlie, establish a water supply and stretch an attack line on Side Charlie for fire control.



You approach this incident from the north on Bunnerong Road and anticipate that you will arrive shortly before the fourth engine and aerial platform.

What actions will you take prior to contacting IC #1 (Engine 1) to begin command transfer?





Following your confirmation of the location and assignment of Engine 1, Engine 2, and Engine 3 and request for a conditions, actions, and needs (CAN) report, IC #1 provides the following CAN:

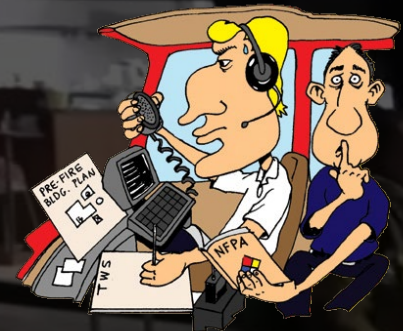
Fire conditions are worsening with fire through the roof on Side Alpha, Engines 1 and 2 are applying water with limited effect. Need to shift to a defensive strategy.



State the communication you would have with IC #1 and dispatch to complete the command transfer exactly as you would transmit it.



What action would you take based on the CAN from Engine 1 (IC #1), State the communications you would have with dispatch and/or operating companies exactly as you would transmit them.

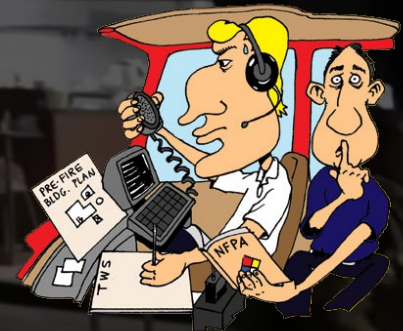


Dispatch advises that your 3rd alarm resources are Engines 6 and 7, Rescue 6, Hazmat 7, Logistics 3, and Chief 2

Engine 4 arrives and reports that they are Level 1 on Heffron Road at Bunnerong Road. State the tactical assignment you would give them exactly as you would transmit it.



Platform 4 arrives and reports that they are Level 1 on Heffron Road at Bunnerong Road. State the tactical assignment you would give them exactly as you would transmit it.



Engine 5 arrives and reports that they are Level 1 on Heffron Road at Bunnerong Road. State the tactical assignment you would give them exactly as you would transmit it.



Engine 6 reports that they, Engine 7, and Chief 2, are in Level 2 Staging on Heffron Road. State the tactical assignment you would give the resources in Level 2 Staging exactly as you would transmit them.



Based on the resources available in Level 2 Staging, would you change your resource determination? If so, state the communication that you would have with dispatch to revise your resource determination exactly as you would transmit it.



What was the actual problem once you arrived?

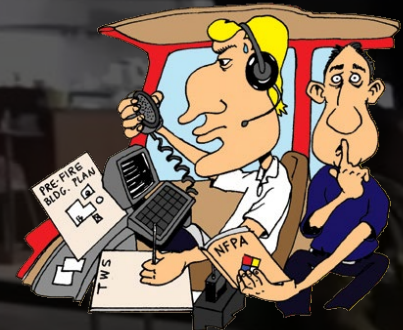
What were your tactical priorities and what was getting in the way of achieving them?

Was there an immediate threat of serious injury or death to the companies operating at this incident?



Was it reasonable to believe that the Main Fire Occupancy and Exposures were occupied?

Was there searchable space in the Main Fire Occupancy and Exposures ?



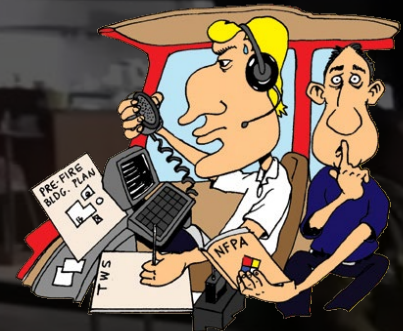
If you believed there was searchable space and that it was reasonable that the Main Fire Occupancy and/or Exposures were occupied, what could you do about it?



Watch the incident video
(Emergency NSW. (2025)
from 03:01 to 11:00
illustrating actual incident
conditions before answering
the next several questions.

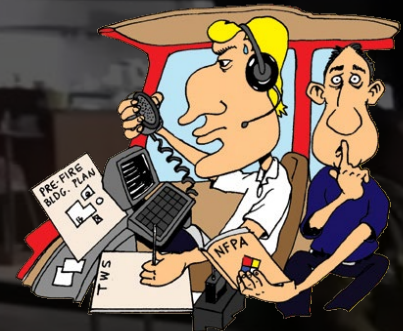


How did you address the need to shift to a defensive strategy identified in IC #1's CAN report?



Did you identify a need to search and check for fire extension in the Bravo 1 and Delta 1 exposures? If so, which exposure was your highest priority and how did you address this need?

What critical factors influenced your decision making?



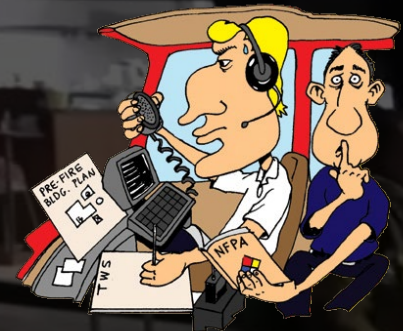
The IC at this incident increased the resource determination to a 4th alarm, adding two additional engines, an additional aerial platform, a hazmat unit, duty commander, command can and two superintendents.



The second aerial platform was positioned on Side Charlie (Wild Street at Wild Lane) and deployed for elevated master stream operations.



Watch the incident video (Garden, 2025) illustrating elevated master stream operations.



What would be necessary for aerial platforms working on Sides Alpha and Charlie to be effective in application of exterior water from their elevated master streams?



As IC #2, how would you approach incident organization of this incident to provide effective supervision of companies operating on Side Alpha, Side Charlie, and any operations conducted in the Bravo 1 and Delta 1 Exposures?



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2026



Chapter 13 Search and Rescue

How do we coordinate search with fire attack and ventilation (isolate & vent? what does this depend on)?

How do we search (access via door or window, where do we start, what sequence)?

When do we start to search (before, during, or after knockdown/fire control)?



Caveat

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Use of this guide is intended to provide a platform for comparison with international firefighting practices and critical thinking about the content of the guide. This guide or on-line access to all NFPA standards and guides may be purchased at www.nfpa.org.



This provision of the guide makes sense and is applicable in my context.



This provision of the guide may make sense and but would require revision or adaptation to apply in my context.



This provision of the guide does not make sense and is not applicable in my context.

Tactical Considerations

- An evidence-based concept for the fire service to consider implementing into their department to enhance efficiency, effectiveness, and increase knowledge to accomplish their mission.
- Are meant to inform, not replace local standard operating procedures. Each situation is unique, requiring different tactical choices to achieve the incident priorities.
- A tactical consideration is not policy. It is not a specification on how to enact or carry out a specific tactic.

Preferred Technique

A technique that has shown to be *mostly* effective, in *most* environments or with *most* of the potential variables. There are certainly potential outliers based the variables, it would seem to me.

This concept makes me think about discussing “standard conditions” for a given fire condition and/or structure and then describing the “standard actions” that are likely to be the “preferred technique(s)” based on research, experience, and/or training.

Deputy Chief Chris Stewart

NFPA 1700 Committee Member & Blue Card Lead Instructor

13.2 Purpose

The purpose of this chapter is to provide guidance on search and rescue options for tactical consideration.

13.3 Application

The intent of this chapter is for firefighting personnel to apply science-based tactical considerations for search and rescue operations.

Large Group



13.4 General

Group 1

10.4.1 Life safety is and always will be of utmost importance to the fire service, and accomplishing search and rescue must be paramount on the fireground.

10.4.2 Independent of fire department operations, research shows that four items impact the survivability of an occupant within a given space in a structure.

13.5 Search

13.5.1 General

Group 2

13.5 Search

13.5.2 Pre-Fire-Control Search

15.5.3 Search During Fire Control

Group 3

13.5 Search

15.5.4 Post-Fire-Control Search

13.6 Rescue

13.6.1 General

Group 4

13.6 Rescue

13.6.2 Pre-Fire-Control Rescue

13.6.3 Rescue During Fire Control

13.6.4 Post-Fire-Control Rescue

Group 5

Out of Class Assignment





Questions?

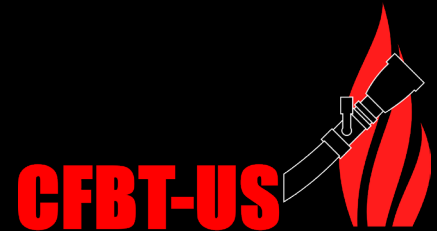
Ed Hartin

Command Competence, CFBT-US LLC

ed.hartin@cfbt-us.com

(503) 793-1296

<https://www.commandcompetence.com>



Strategy, Tactics, and Decision Making for Structural Firefighting



Sensemaking

Practice

Naturalistic
Decision Making

Situational
Awareness

Research

Capabilitie &
Limitations

Day 5

Resources

Fire Dynamics

Strategy

Fire Control

Anti-Ventilation

Ventilation

Search

Tactics





Fire Safety Academy

RESIDENTIAL FIRE NEAR MISS INCIDENT IN LAGRANGE, GEORGIA

Study of Firefighter Line of Duty Injuries and Near Miss Incidents



Feb 16, 2023

🕒 65 mins

Residential Fire Near Miss Incident in LaGrange, GA

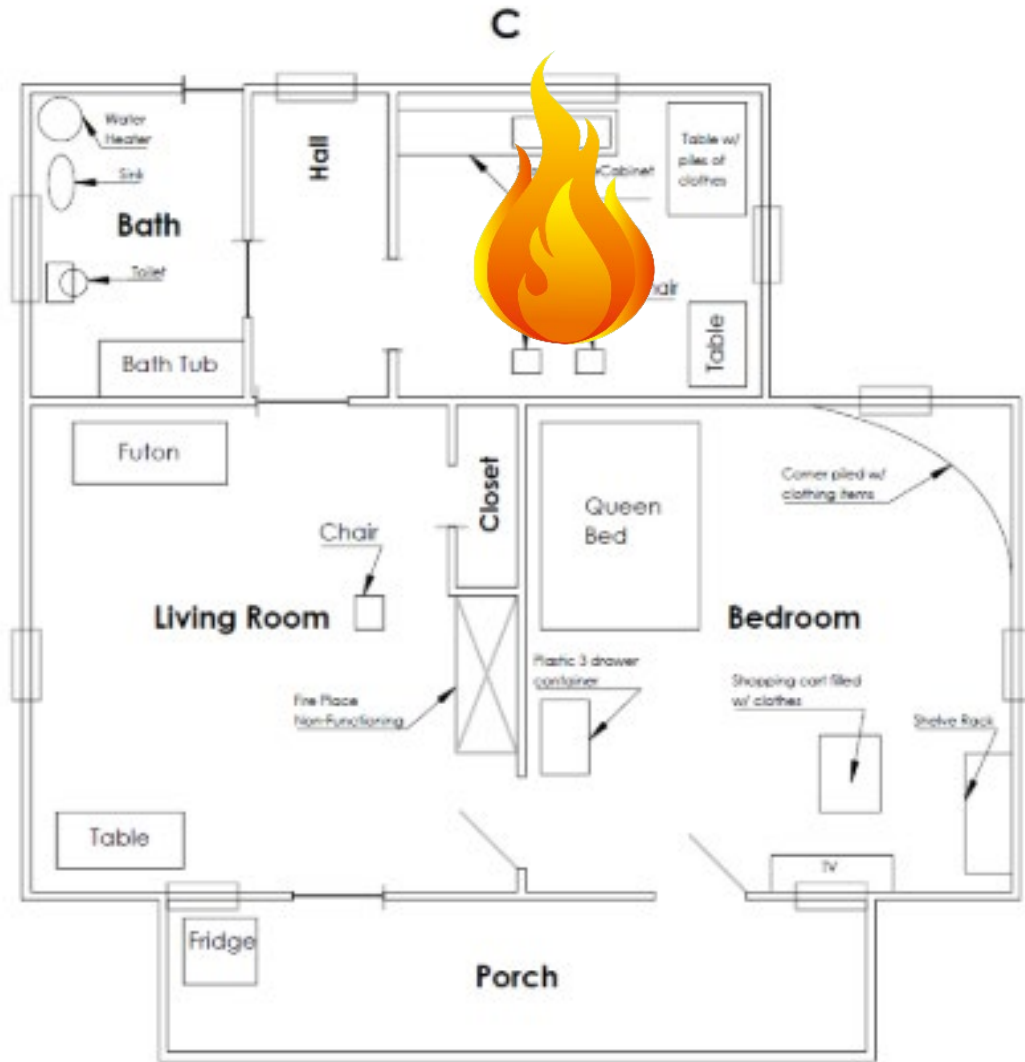
📌 Fire Dynamics, Suppression,
Ventilation, Near Miss/Line of Duty
Death

La Grange Near Miss/Injury Report



305 Revis Street
Lagrang, Georgia
September 3, 2018 at 02:50





Four Firefighters Burned in Residential House Fire - Georgia

Mark B. McKinnon
Daniel Madrzykowski
UL's Fire Safety Research Institute
Columbia, MD 21045
Revised April 24, 2023

This publication is available free of charge from:
<https://dx.doi.org/10.54206/102376GEKK4148>

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LABORATORIES™



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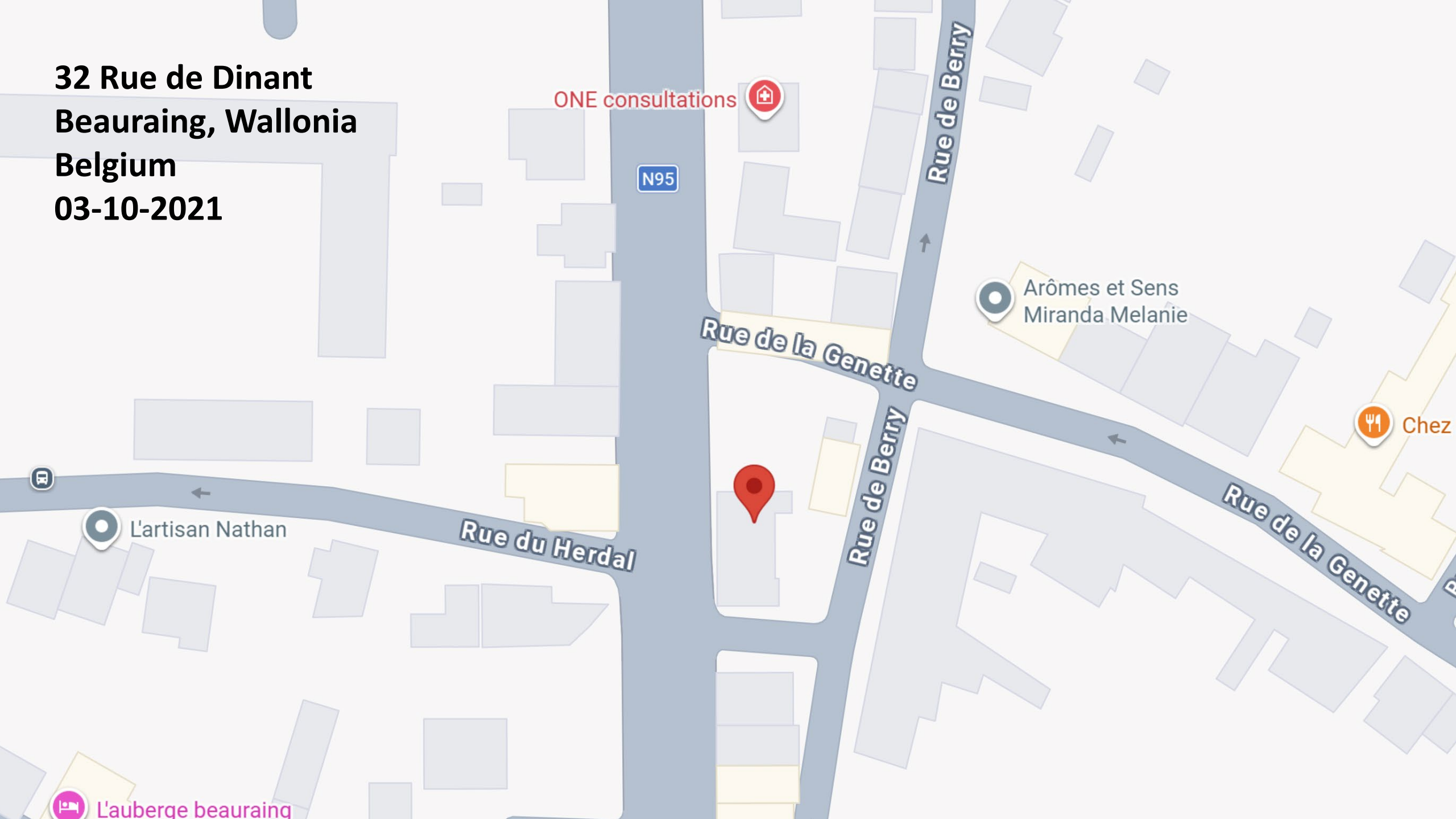
**FIRE SAFETY
ACADEMY**

**Residential Fire Near Miss Incident
in LaGrange, Georgia**
training.fsri.org



Make Something!

32 Rue de Dinant
Beauraing, Wallonia
Belgium
03-10-2021



**32 Rue de Dinant
Beauraing, Wallonia
Belgium
03-10-2021**



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2026



Summary Discussion



This provision of the guide makes sense and is applicable in my context.



This provision of the guide may make sense and but would require revision or adaptation to apply in my context.



This provision of the guide does not make sense and is not applicable in my context.

Survive, Prevent Harm, Be Nice

Chief Alan V. Brunacini



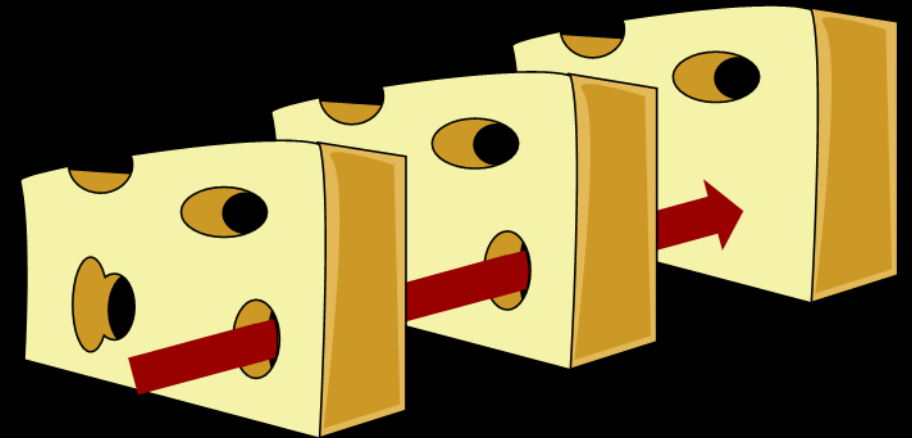
Crew Resource Management (CRM) has been around for a long time. Need to get agencies to be little beach heads for implementing CRM and the related behaviors. Standard way to implement evaluation, decision-making, and tactical processes. Young people today are used to having an explanation of why something is being done. The why needs to be communicated, even when it is an emergency.

Chief Alan Brunacini

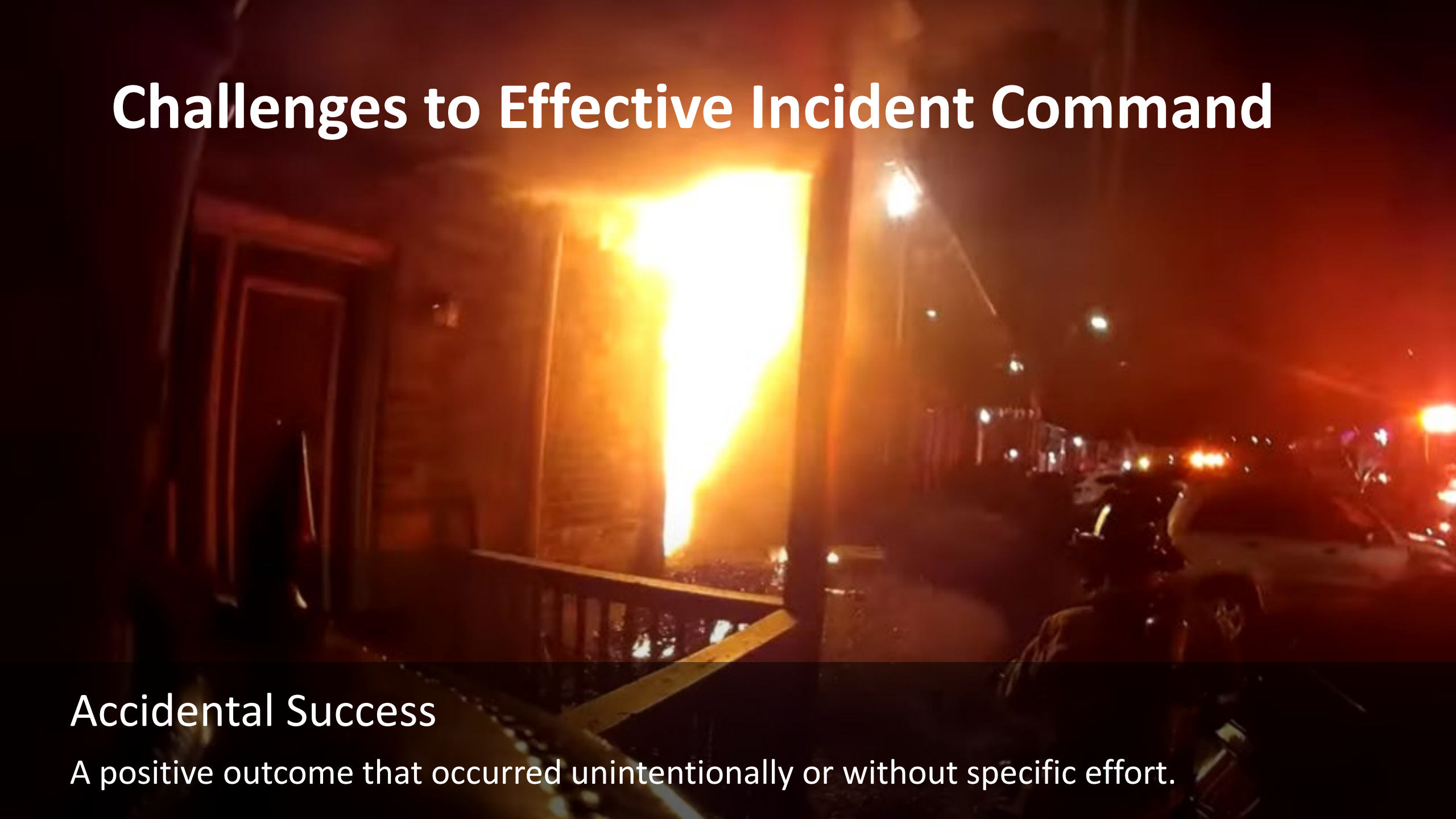


Page 18

Loyal Insubordination vs
Malicious Compliance



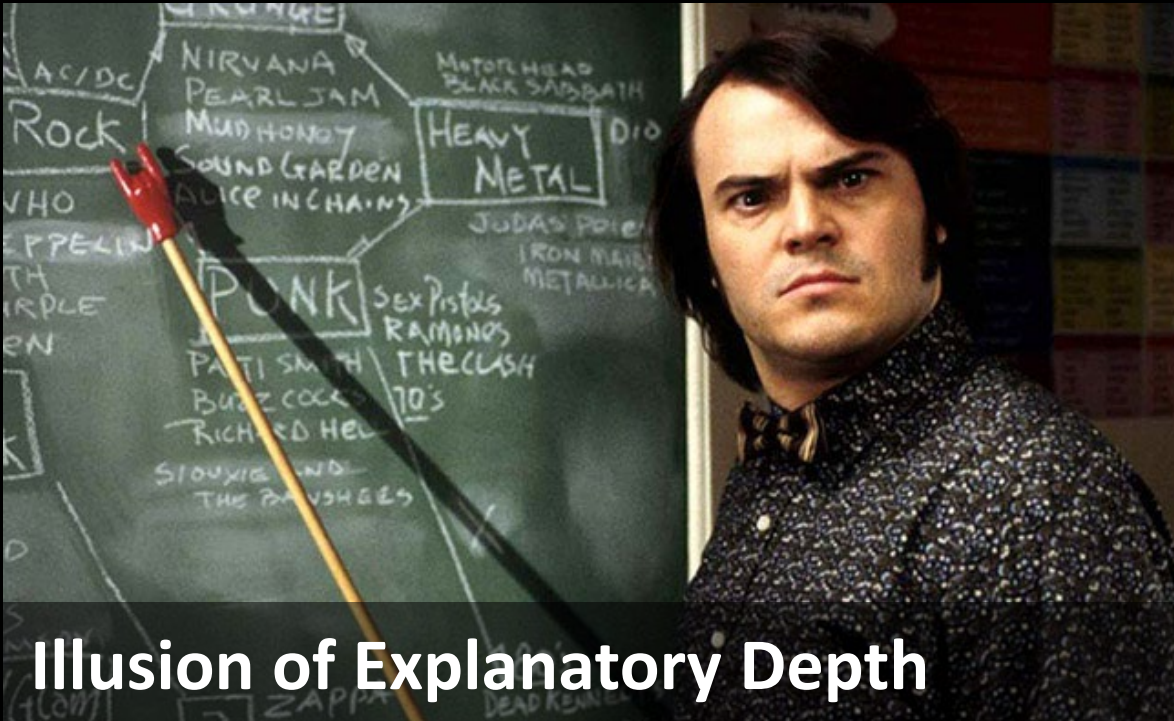
Challenges to Effective Incident Command

A night scene of a building fire. A large, bright orange flame is visible through an open doorway of a building. Firefighters in dark gear are visible in the foreground and background, working on the scene. The scene is illuminated by the fire and emergency lights, creating a high-contrast, dramatic effect.

Accidental Success

A positive outcome that occurred unintentionally or without specific effort.

Challenges to Effective Incident Command

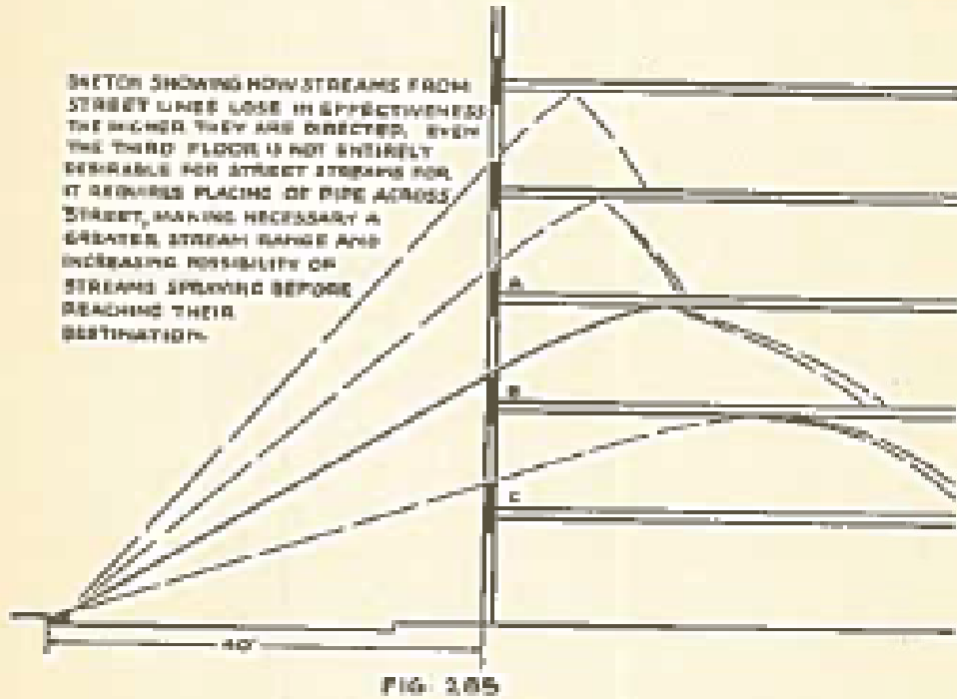


You probably **don't know** as much as **you think** you do.

- What is the impact?
- What can we do about it?

We can't implement effective tactics when we don't understand the fire environment and the effect of our operations.

SKETCH SHOWING HOW STREAMS FROM STREET LINE LOSE IN EFFECTIVENESS THE HIGHER THEY ARE DIRECTED. EVEN THE THIRD FLOOR IS NOT ENTIRELY DESIRABLE FOR STREET STREAMS FOR IT REQUIRES PLACING OF PIPE ACROSS STREET, MAKING NECESSARY A GREATER STREAM RANGE AND INCREASING POSSIBILITY OF STREAMS SPREADING BEFORE REACHING THEIR DESTINATION.



Fire Chief's Handbook Fred Shepherd, 1932

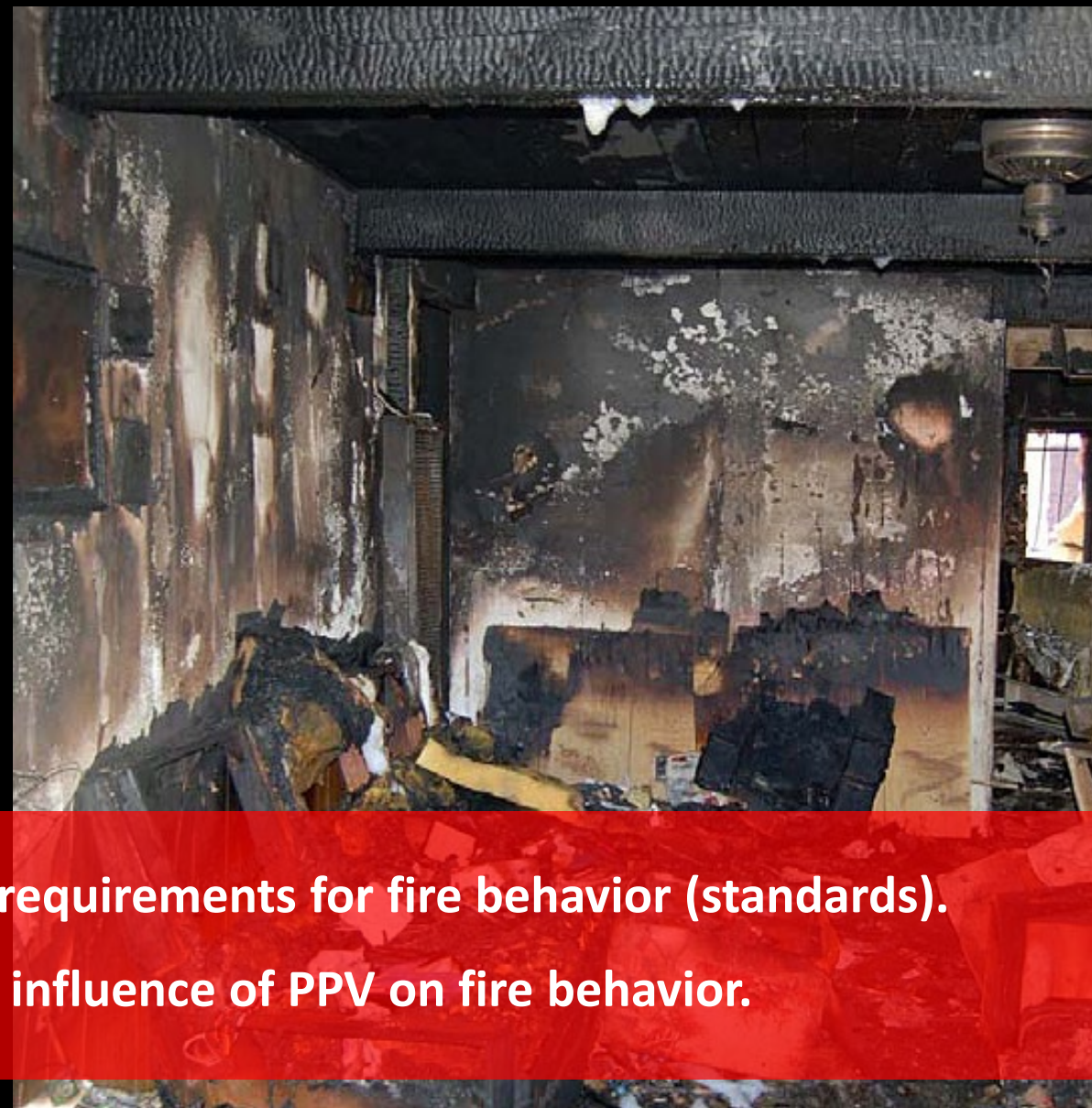
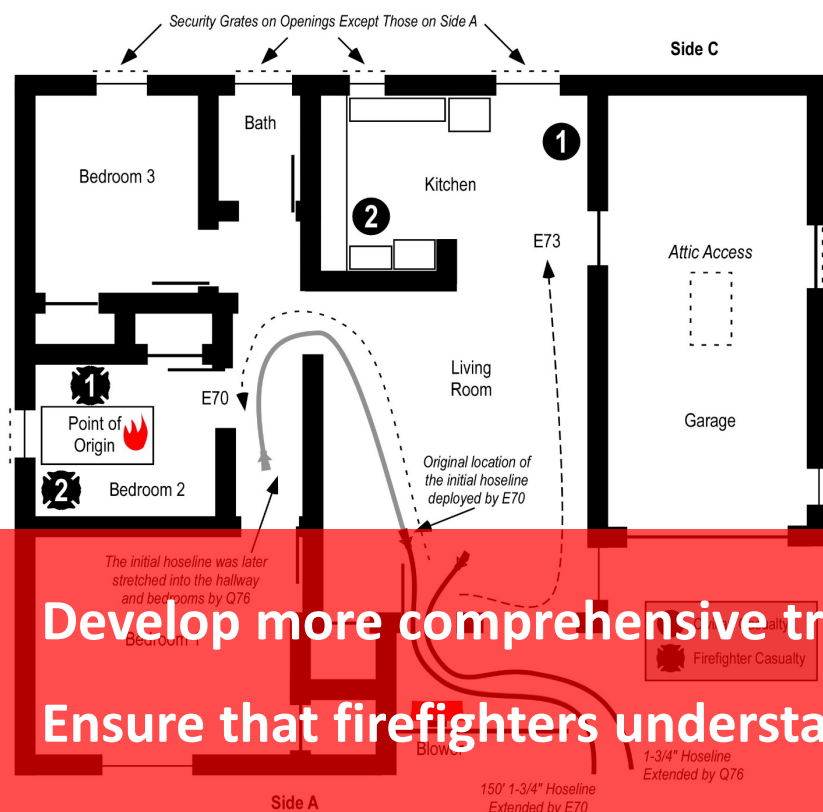


It Ain't What You Don't Know
That Gets You Into Trouble.
It's What You Know for Sure
That Just Ain't So

Mark Twain

Captain Matthew Burton and Engineer Scott Desmond
149 Michele Drive, San Pablo, California
LODD July 21, 2007 (NIOSH F2007-28)





- Develop more comprehensive training requirements for fire behavior (standards).
- Ensure that firefighters understand the influence of PPV on fire behavior.



Firefighter Bret Tarver
Southwest Supermarket, Phoenix, Arizona
LODD March 14, 2001



The first **what** after the Brett Tarver LODD that was generated by the firefighters and company officers was “bigger air cylinders.” Fortunately, Chief Alan Brunacini and the Phoenix Fire Department focused on the **why**.

Purpose of the Incident Command System

Effectively accomplish and survive the work.



Lack of effective incident command is a major contributing factors in almost all traumatic, fireground line-of-duty deaths.

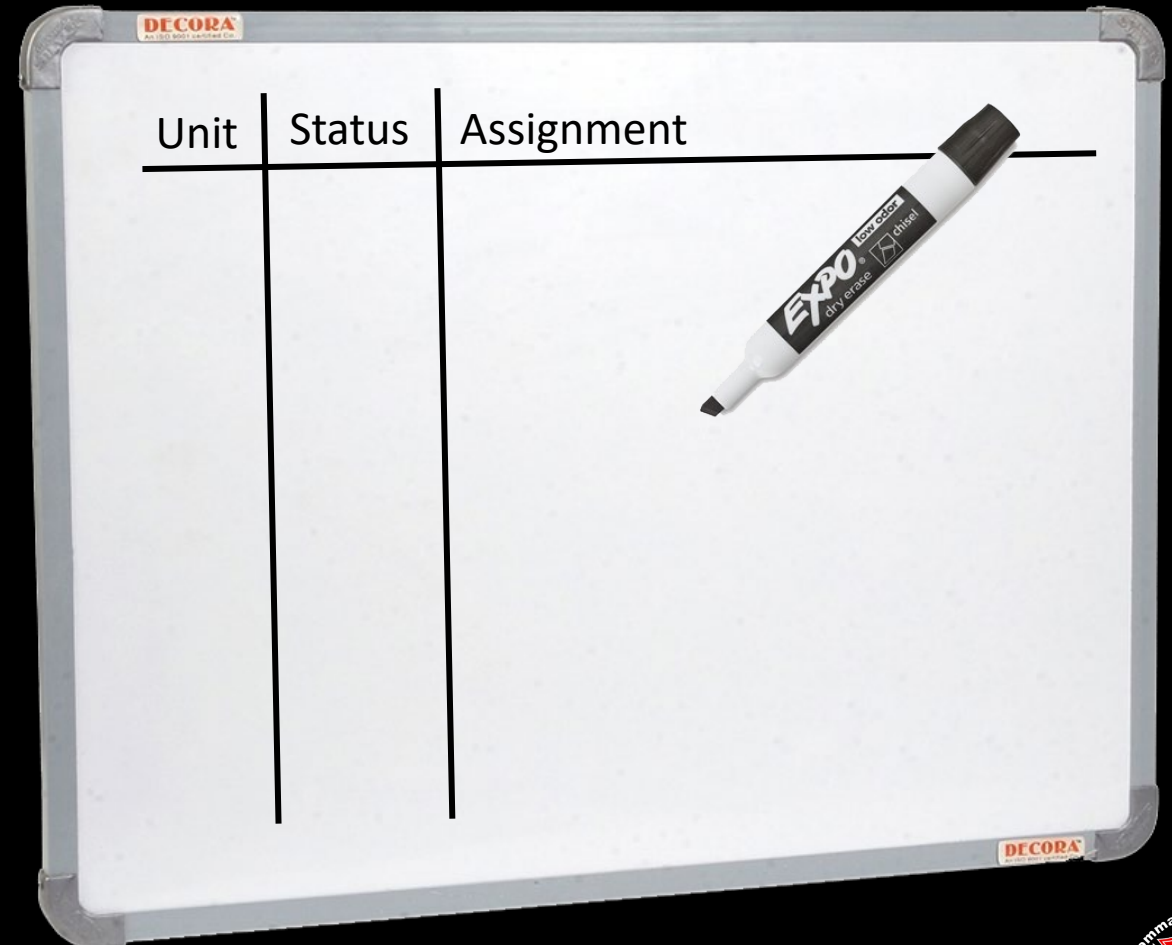
Functions of Command

1. Deployment
2. Assumption, Confirmation, & Positioning of Command
3. Situation Evaluation
4. Strategy & Incident Action Planning
5. Communications
6. Organization
7. Review, Evaluate & Revise
8. Continue, Support, & Terminate Command

Strategic, Tactical, and Task Level Accountability

Strategic Level Accountability

1. Who works for you?
2. Where are they?
3. What are they doing?
4. How long have they been working?
5. Are they making progress?





IC #1

**Strategic Level
Risk Management,
Strategy, IAP, &
Command**

**Task Level
Crew Supervision
& Doing Work**

**Tactical Level
Supervising Other
Companies**

IC #1 Functions at all Three Levels



Command Function 6

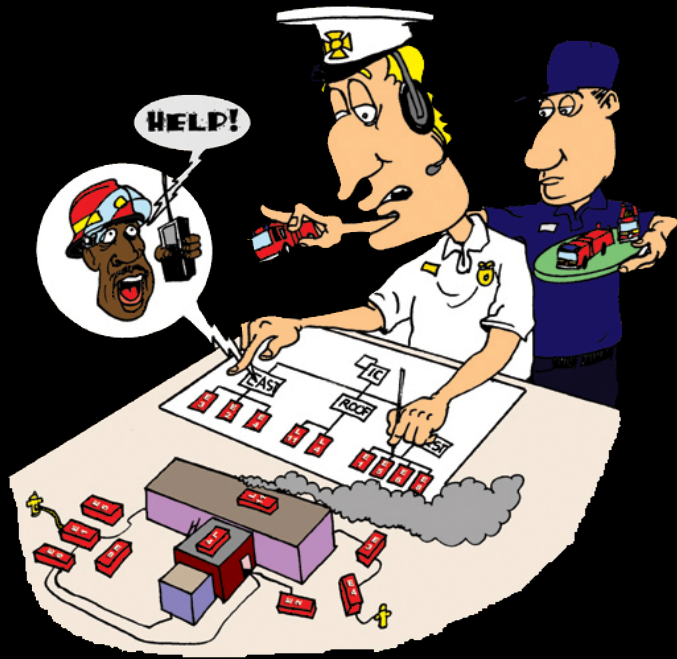


Organization



Major Goal

Develop an effective incident organization using divisions & groups to decentralize and delegate geographic and functional responsibility



How do you organize to maintain span-of-control and provide effective tactical supervision?

Command Function 8



Continue, Support and Terminate Command

Provide the required duration of command necessary to complete the tactical priorities, standardize command support and to ensure the safety of operations.



How do you support
command and ensure the
safety of operations?





Your procedures must be simple
because the fire will provide all the
complications you could ask for.

Commissioner Leo Stapleton
Boston Fire Department



Match and balance command with the size, structure, complexity, and duration of the incident



5522 James Blair Drive, Brownsburg, IN

May 28, 2018, at 06:30

**Main Fire
Occupancy**



**Delta 1
Exposure**



06:30

Armstead Ave

5522



5534

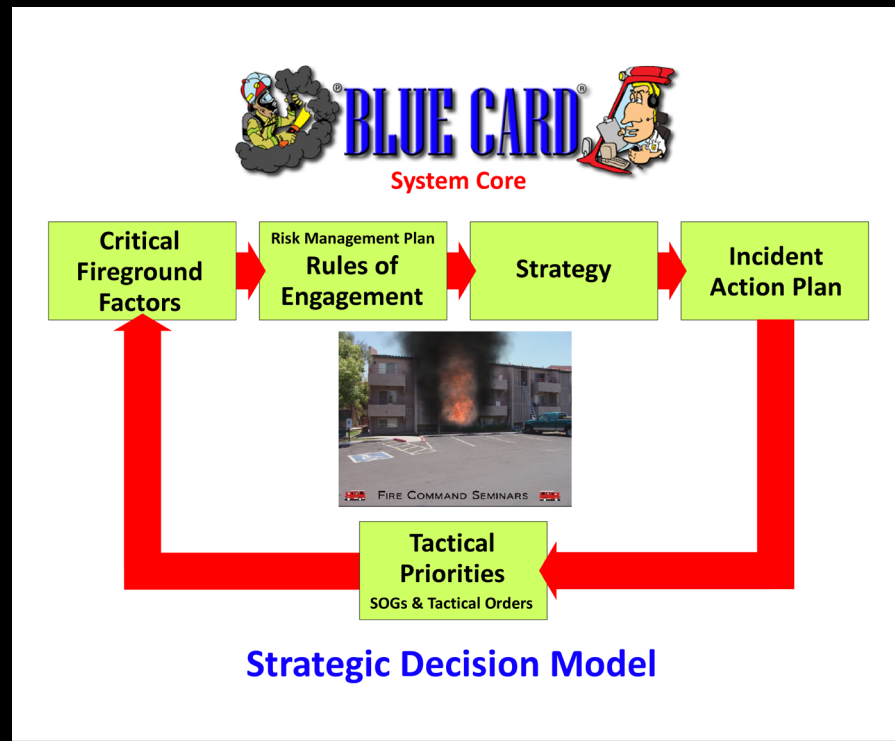


450'

James Blair Dr



Strategic Decision-Making Model



Critical Factors



Fixed Critical Factors

- Two, two-story houses
- Likely lightweight construction
- Normal fire load for occupancy
- Good access on alpha
- Water Supply

Variable Critical Factors

- Working fire
- Extension to Delta 1
- Time of day
- Life hazard in both houses

Not necessarily a comprehensive list!



Risk Management Profile



We operate in a deliberate and calculated manner!

- We will not risk the lives of our members for lives or property that is already lost.
- We will accept limited risk to save savable property.
- We will accept a greater level of risk to protect savable lives.

Offense or Defense



Strategy is based on current and projected:

- Fire behavior
- Structural stability
- Resources

Consider variations in conditions and searchable vs. “survivable” space!

Tactical Priorities

Offense

1. Fire Control
2. Primary search
3. Tactical ventilation
4. Secondary search
5. Loss control
6. FF Decon

Defense

1. Collapse Zone
2. Cutoff Points
3. Protect Exposures
4. Search/Evacuate Exposures
5. Fire Control
6. FF Decon



Tactical Assignments



Tactical Assignments (X2)

- Water supply (Forward Lay)
- Quick hit on exterior fire
- Fire control & primary search
- Primary search & check for extension
- Tactical ventilation
- Secondary search
- Utility control
- Property conservation

How many companies will be required to fulfill these tactical assignments?



Initial Command
Working IC #1



Reenforced Command
Strategic IC #2

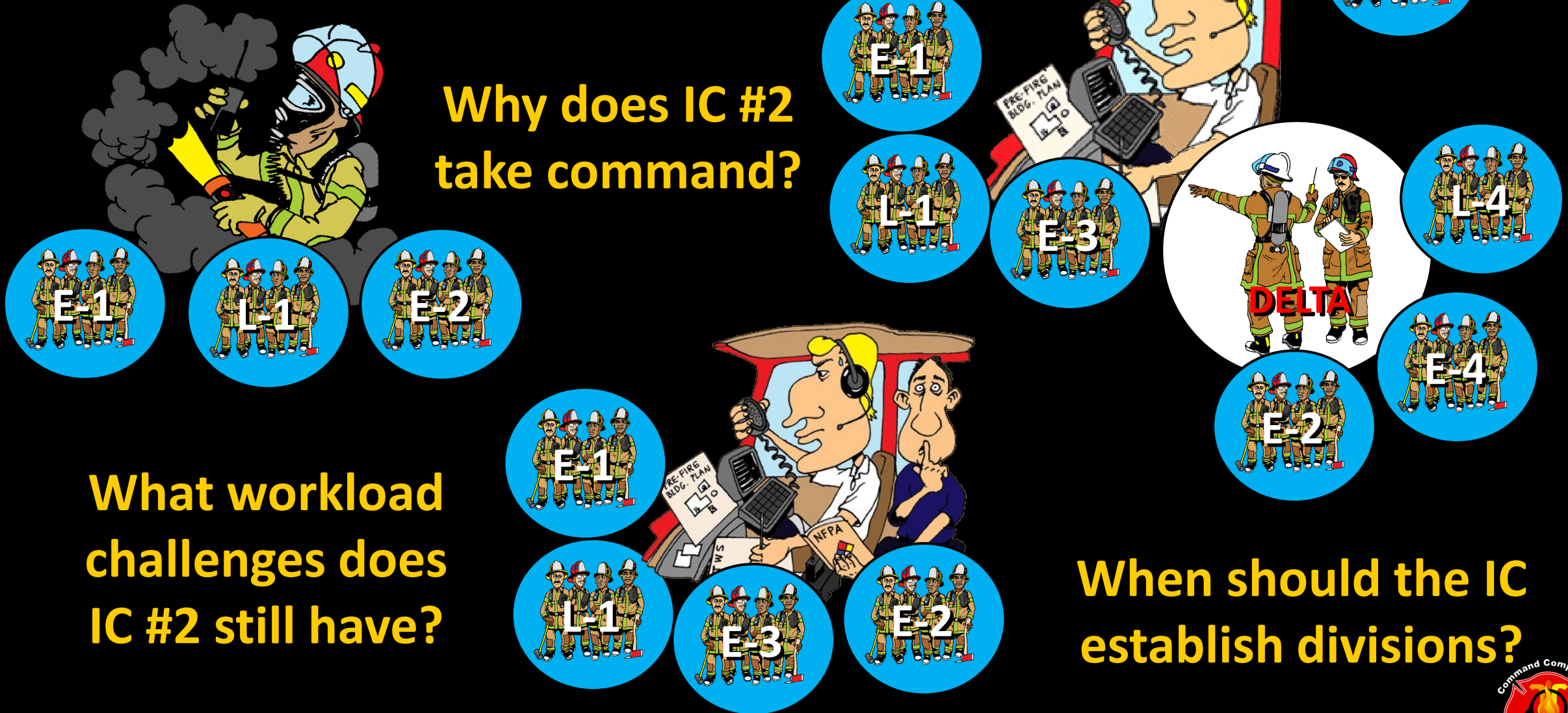
**Increased incident complexity and size
requires escalation of command.**

Reinforcing Command

Why does IC #2 take command?

What workload challenges does IC #2 still have?

When should the IC establish divisions?



Strategic Level

Responsibilities

- Perform 8 Functions of command
- Evaluate critical fireground factors
- Develop and manage the strategy
- Manage completion of the tactical priorities
- Overall safety boss
- Manage risk
- Coordinate the IAP with divisions and groups
- Manage resource ordering & allocation



Tactical Level

20 m

Responsibilities

Tactical

- Risk management
- Positions match Conditions
- Tactical priorities
- Division action plan
- Coordination
- Match IC's intent

Safety

- Accountability
- Air management
- Work-rest cycles
- On-deck, recycle & rehab

Division Supervisor/Division Safety Work as a Team



Task Level



2 m

5 m

Responsibilities

- Follow SOP's
- Get into the game properly
- Manage crew accountability
- Round trip ticket
- Stay on hoseline
- Maximum 55 m inside
- Manage work cycle
- Keep crew intact

Organizational Truth

ICs should divide an incident to manage their span-of-control.

ICs should avoid re-naming companies based on their function.



**Divisions
Groups = Sectors**

**Forecast and establish divisions when
2 to 3 companies are required in one work area**



Naming Divisions

Alpha, Bravo, Charlie, Delta (Sides)
1, 2, 3, 4 (Floors)

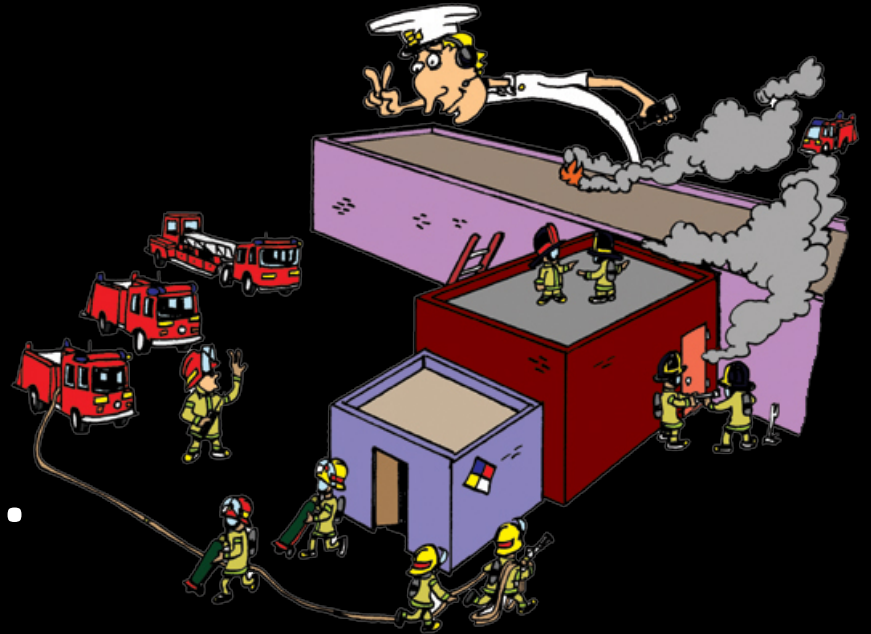


Blue Card does not use Groups (Functional Sectors) Inside the Hazard Zone

Divisions are responsible for completion of **all** tactical priorities in their assigned division.

Divisions simplify tracking resources by position and function.

Groups are used outside the hazard zone for functions like Water Supply & Medical.





Division Supervisor

Hazard Zone Job Description

Division Supervisors have two Major Responsibilities

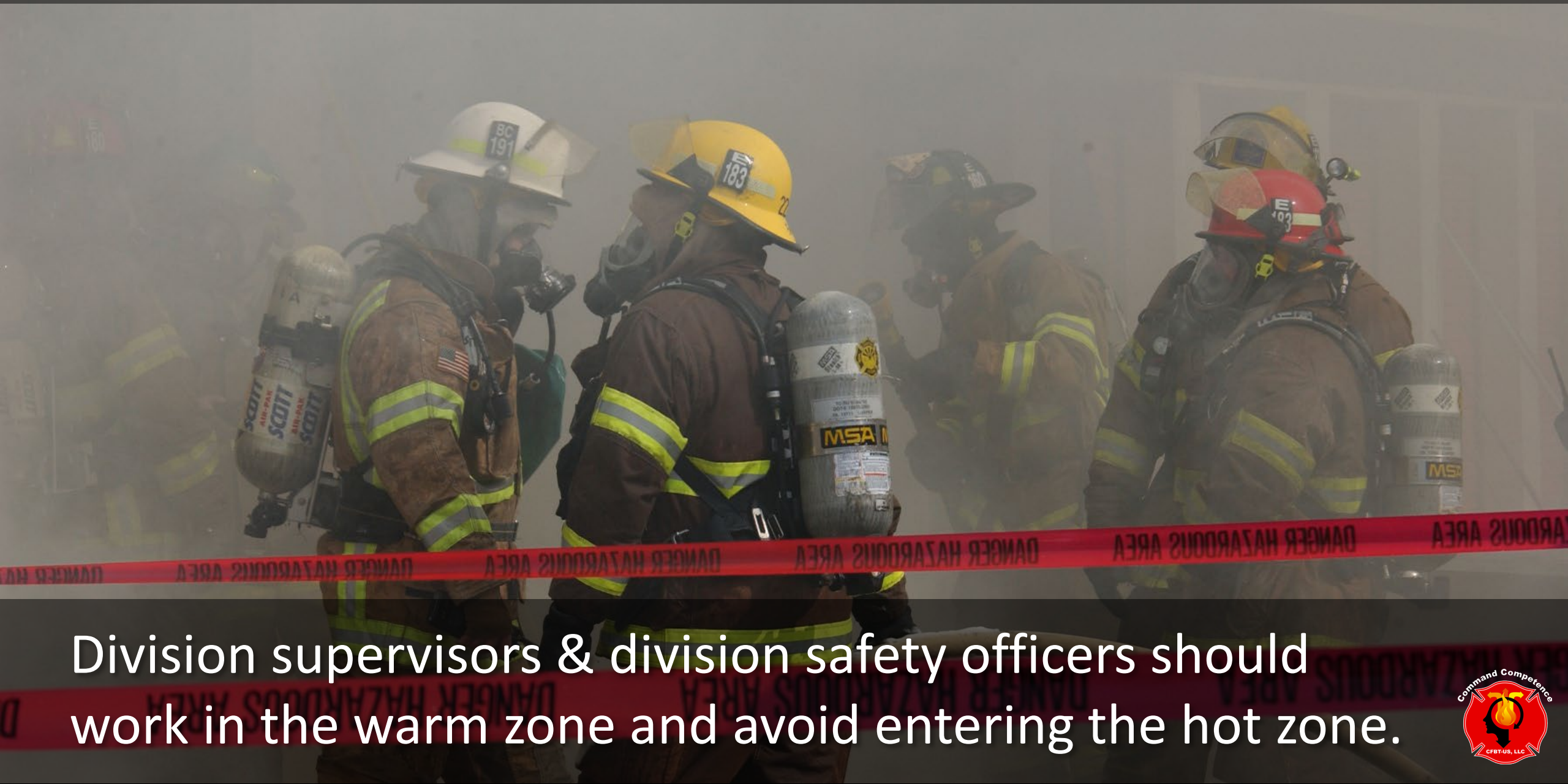
**Tactical
Supervision**



**Embedded
Safety**

If the division supervisor does not have a safety officer assigned, they are responsible for both tactical supervision and safety

Personal Protective Equipment



Division supervisors & division safety officers should work in the warm zone and avoid entering the hot zone.



Division Tactical Level Supervision

- Division IAP matches IC's Plan
- Division risk management (positions match conditions)
- Entry control
- Manage resources & complete tactical priorities





**Task Level
(Company)
Supervision**

**Tactical Level
(Division)
Supervision**

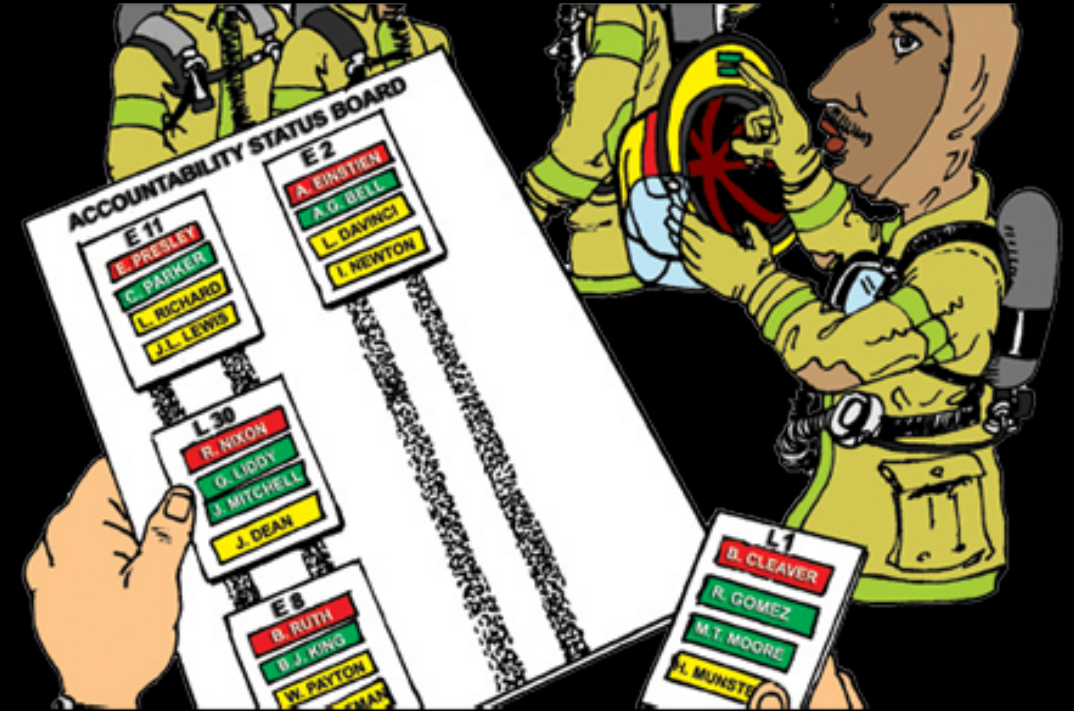
You can't ride two horses with one ass!



Working alone limits a division supervisor's span of control (limit companies to no more than four)

Division Embedded Safety

- Accountability
- Air management
- Rotation of companies
- On-deck companies
- Recycling
- Sending companies to rehab



The division safety officer works with and for the division supervisor.

Safety must be integrated into the task, tactical, and strategic levels of incident operations; not addressed as a separate component in addition to our normal response



Task



Tactical



Strategic

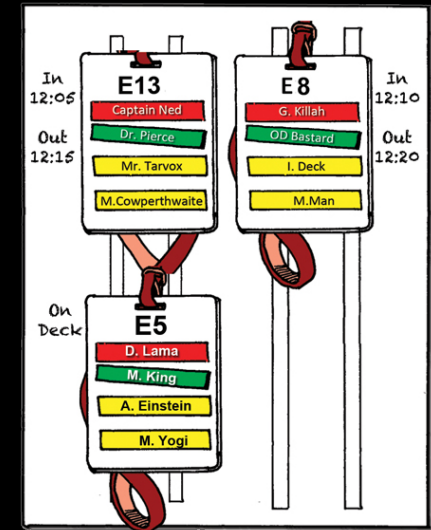
Division Accountability Routine



The engineer of the attack position provides initial accountability.



When upgraded, division safety officer will collect the passports at the original accountability location.



Once upgraded, passport accountability will occur at the entry point and will be managed by division safety officer.

The division safety officer ensures that companies are ready to go to work before entering the hazard zone.



- Protective clothing
- SCBA
- Thermal imager
- Radio (on the right frequency)
- Crew integrity



Division Safety Manages Rapid Intervention Equipment





Establishing a Division

1. Division supervisor assigned
2. Division picks up passports
3. Division advises when in place and assuming the division
4. Companies in the division notified that they work for the division.
5. CAN reports to division supervisor
6. Division safety assigned (2nd command officer)



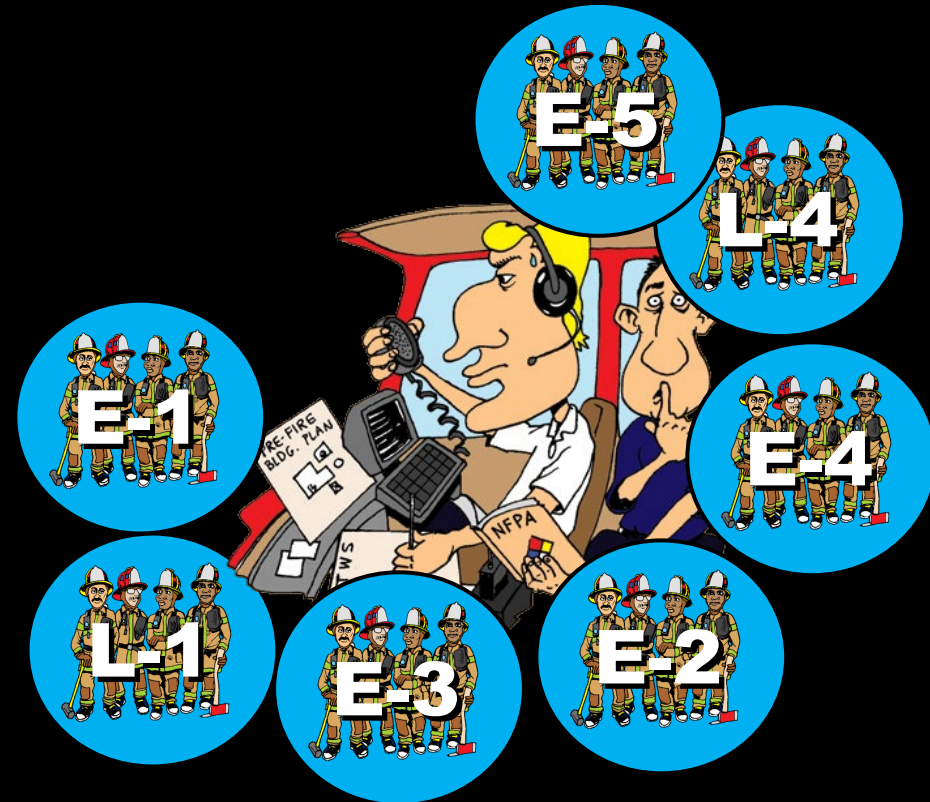
Working together...

- Leave your rank in the fire SUV.
- It doesn't matter what agency you work for.
- You can't define their own division boundaries.
- The division supervises the division safety officer.
- The division supervisor & division safety are a team.
- You can't supervise companies from your agency if they are not in your division.

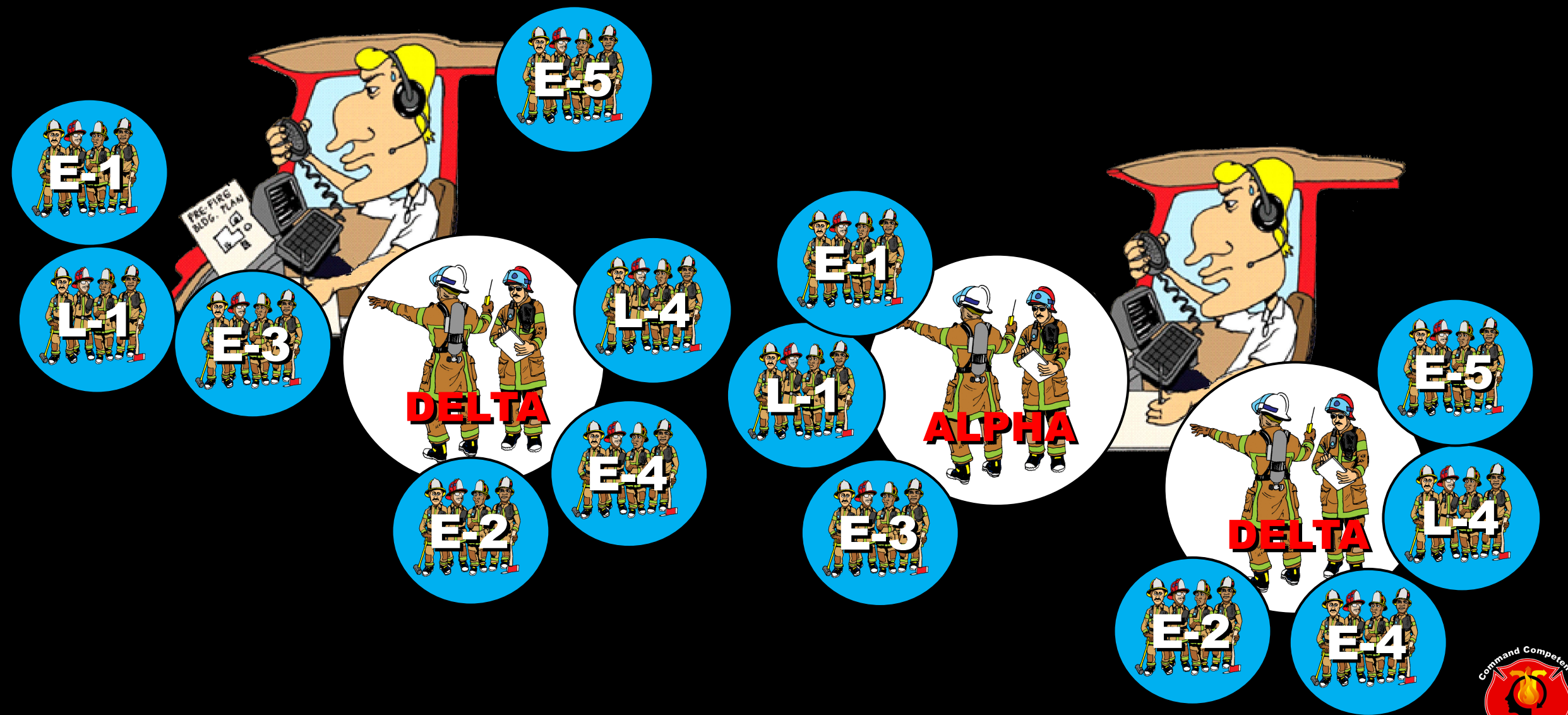
Back to the Incident



Incident Organization



Incident Organization



Tactical Decision Game



Confirmed Residential Fire
808 N Main Street

Decide first then discuss!



808 N Main Street, Coupeville, WA

NW Grace St



NW 8th St

100'

200'

300'



N Main St

● Hydrant



NE 9th St

● Hydrant

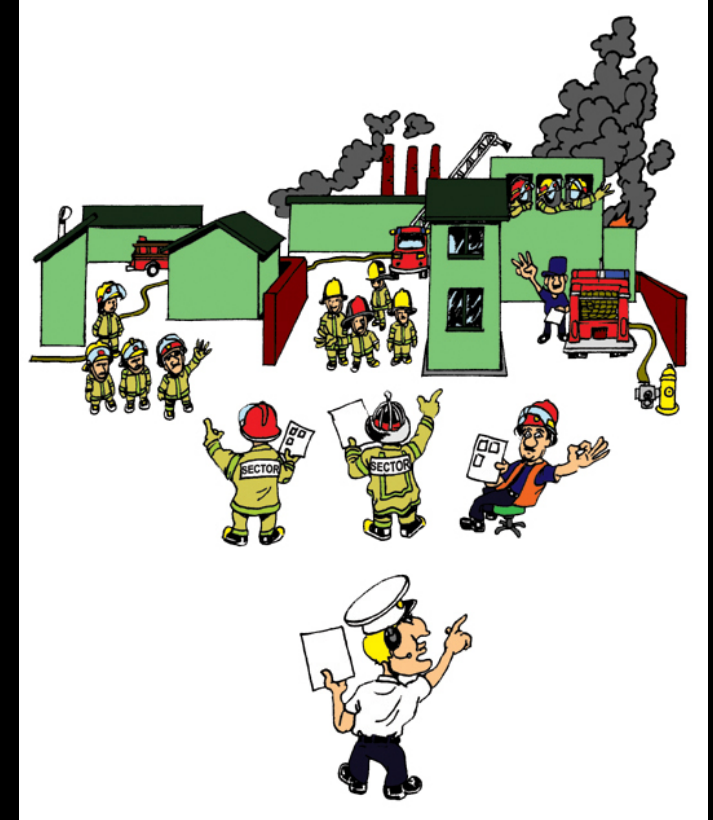
NE 8th St





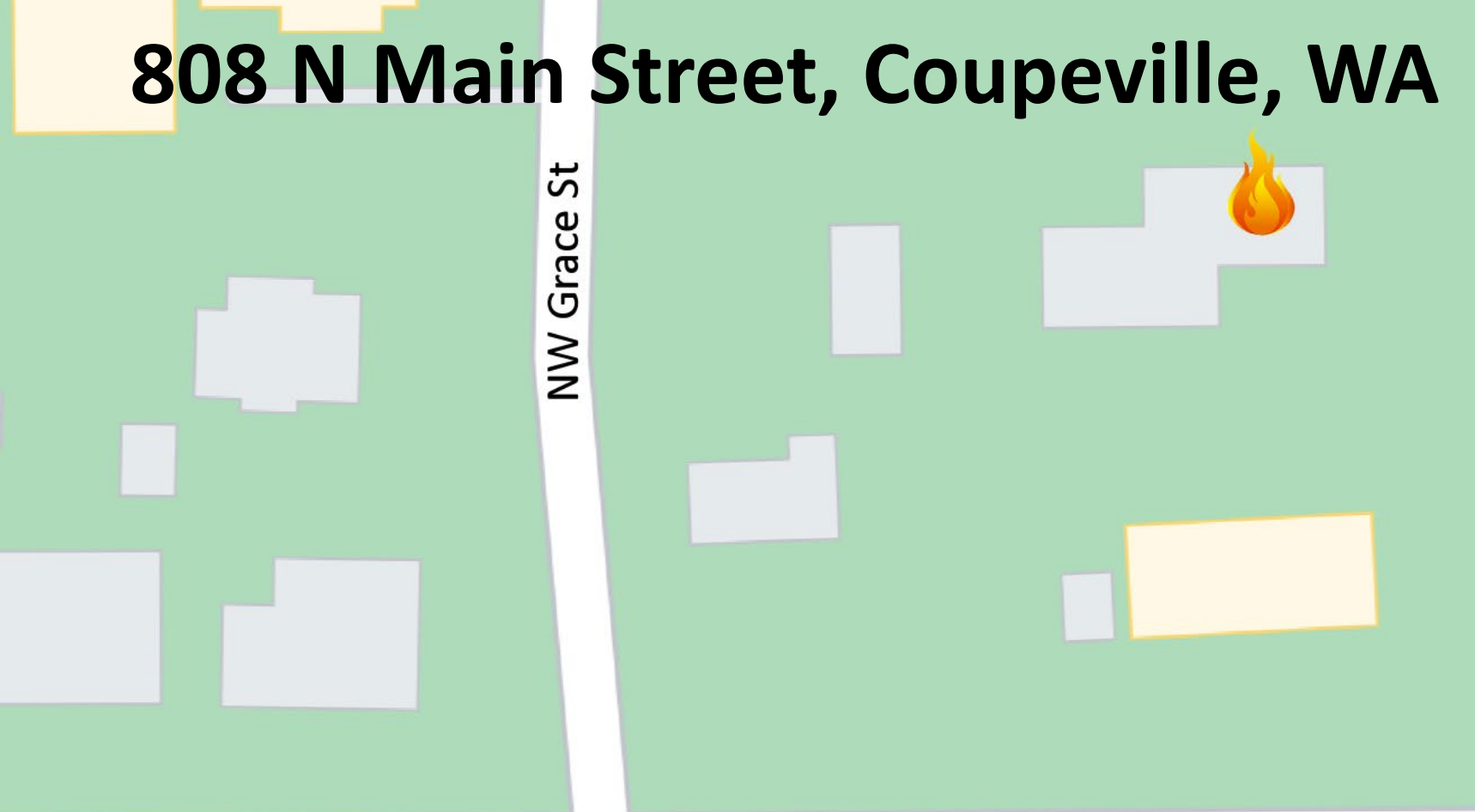
Common Language

1. Level 1 & 2 Staging.
2. On-Deck.
3. Recycle.
4. Accountability Location.

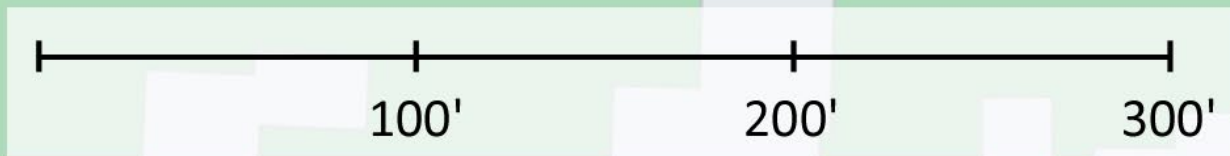


This is not a “Blue Card” class but this scenario draws on some of the important concepts from this program.

808 N Main Street, Coupeville, WA

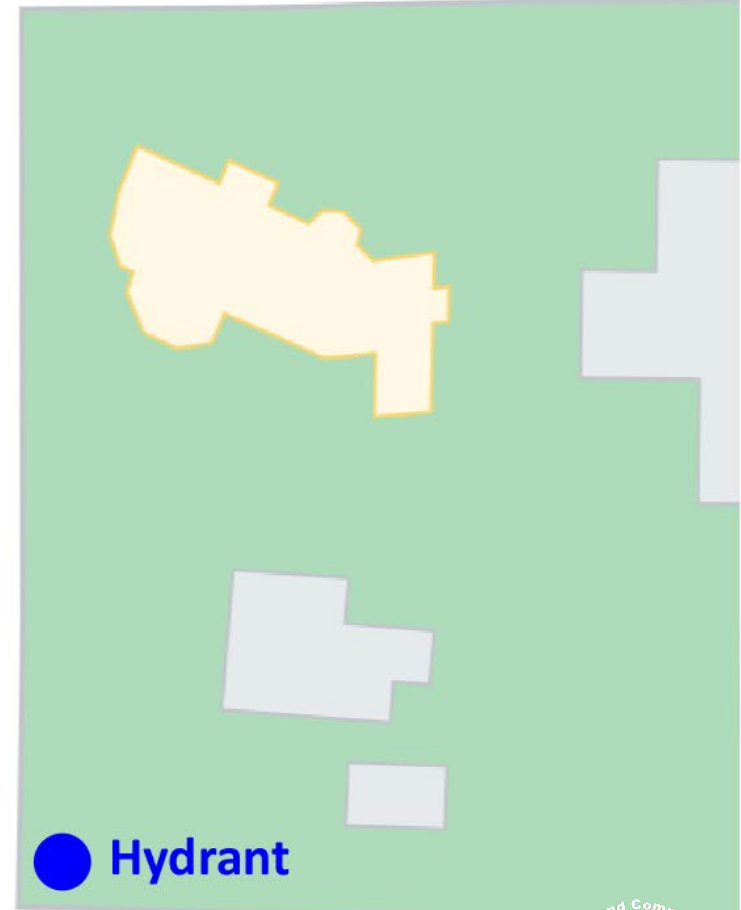


NW 8th St



NE 9th St

N Main St



NE 8th St





Initial Command
Working IC #1



Reenforced Command
Strategic IC #2



Escalated Command
Strategic IC #2
Command Team

**Increased incident complexity and size
requires escalation of command.**



Support Officer

Job Description

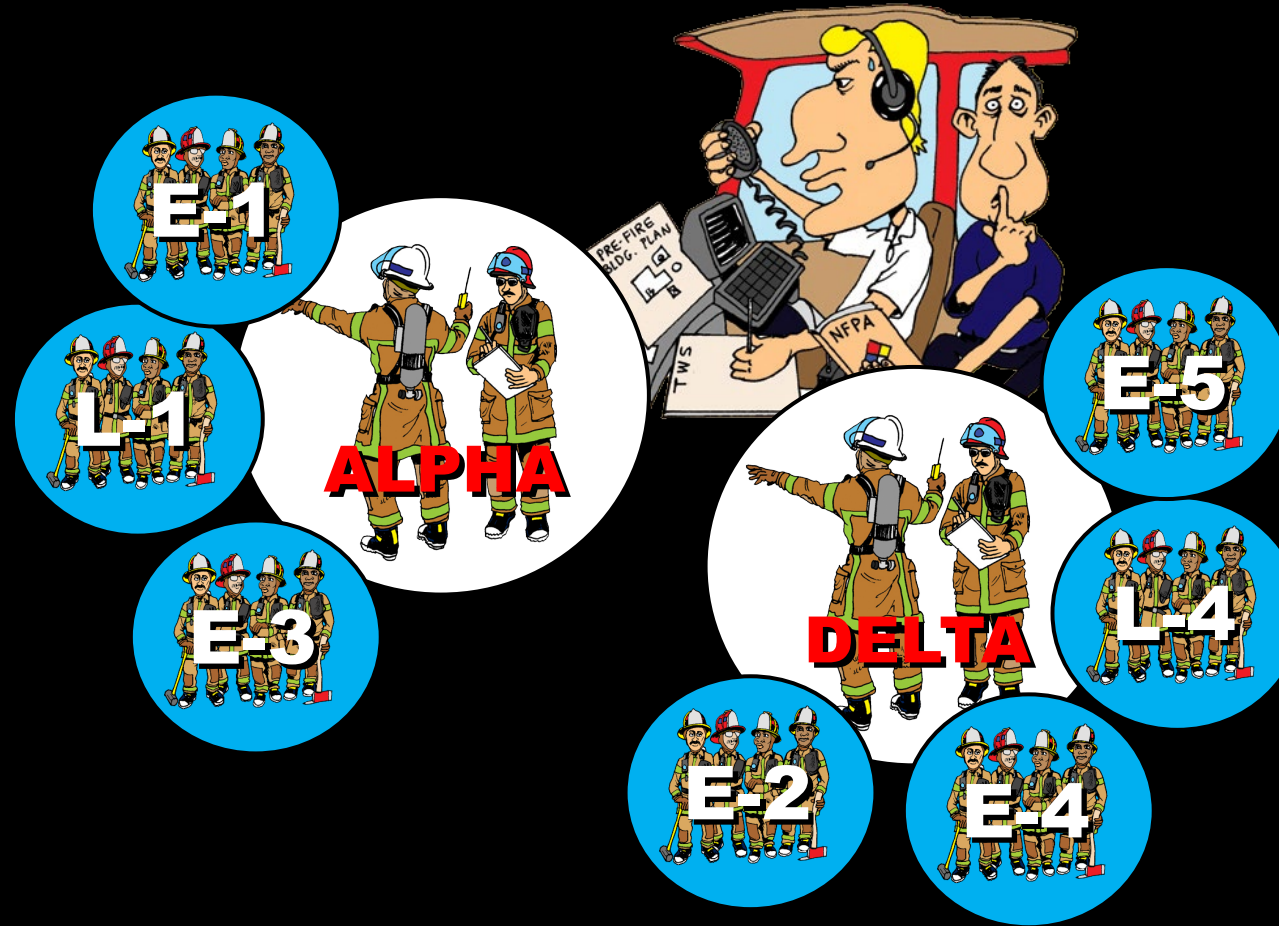
How can a support officer improve the effectiveness of IC #2?



- Positions match conditions.
- Situation evaluation never stops.
- IC inside the vehicle monitoring conditions.
- Completion of the tactical priorities.
- Manage the functions of command.
- Put tactical supervision in all required attack positions.

The support officer performs strategic level accountability by managing the tactical worksheet.

Incident Organization



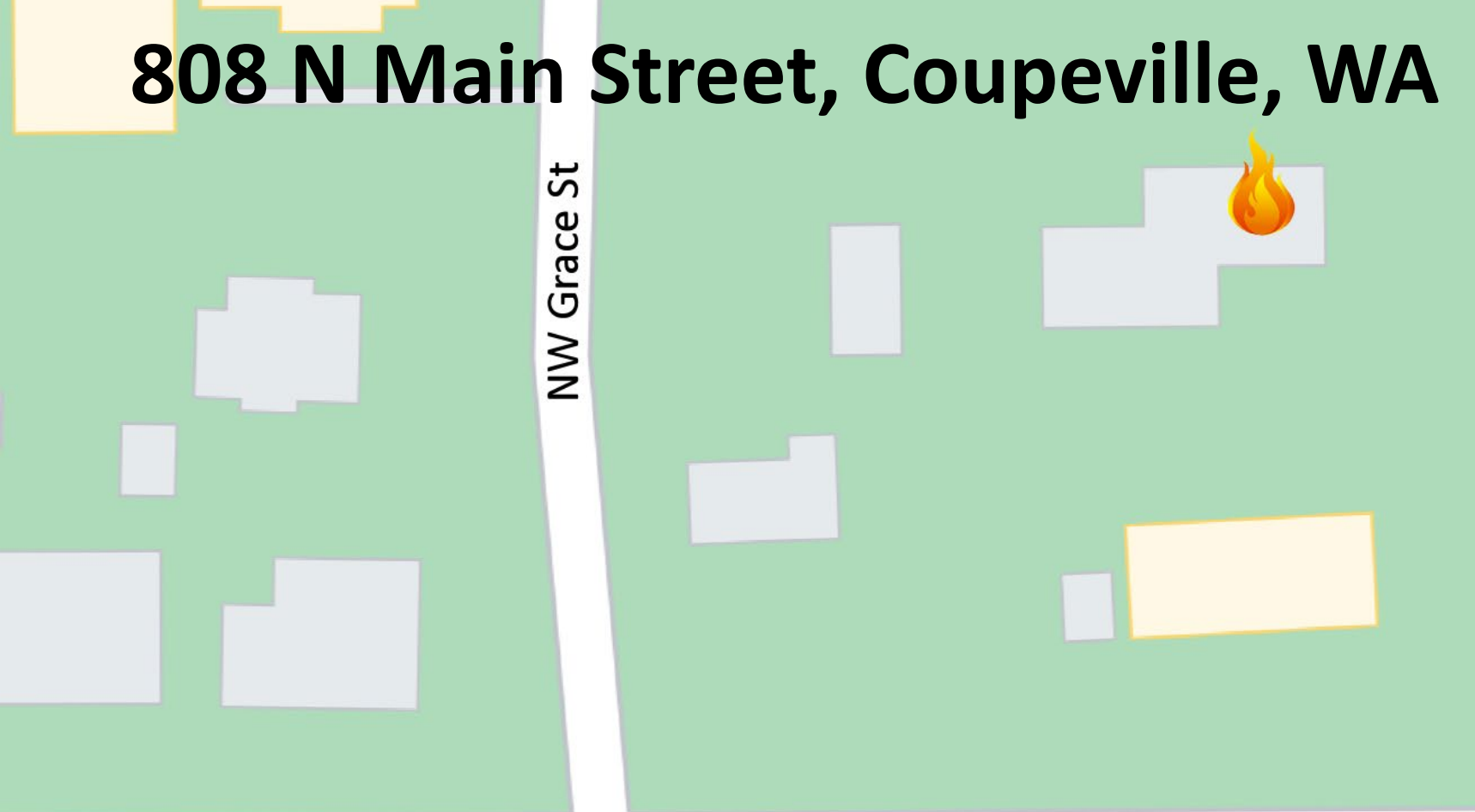
Tactical Decision Game



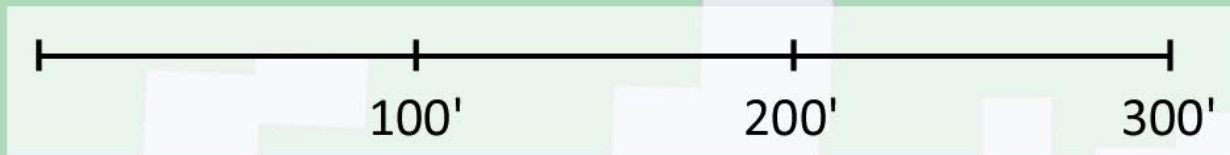
Confirmed Residential Fire
808 N Main Street



808 N Main Street, Coupeville, WA



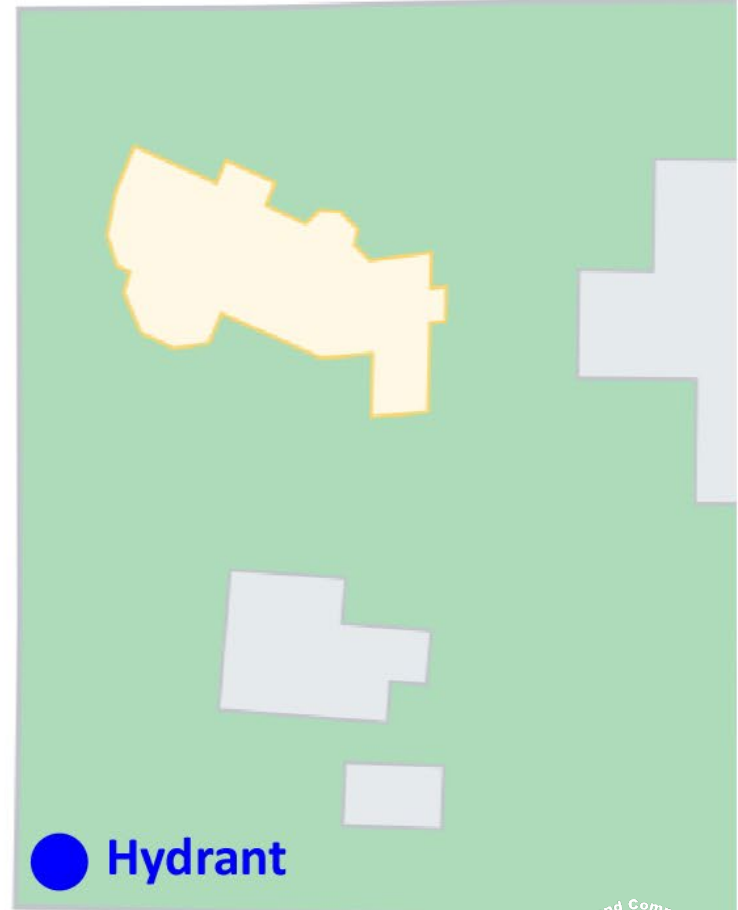
NW 8th St



N Main St



NE 9th St



NE 8th St



Escalating Command



Initial Command
Working IC #1



Reinforced Command
Strategic IC #2
Support Officer



Escalated Command
Strategic IC #2
Command Team



+ Senior Advisor

Escalating Command



How do we manage this
without a command van?

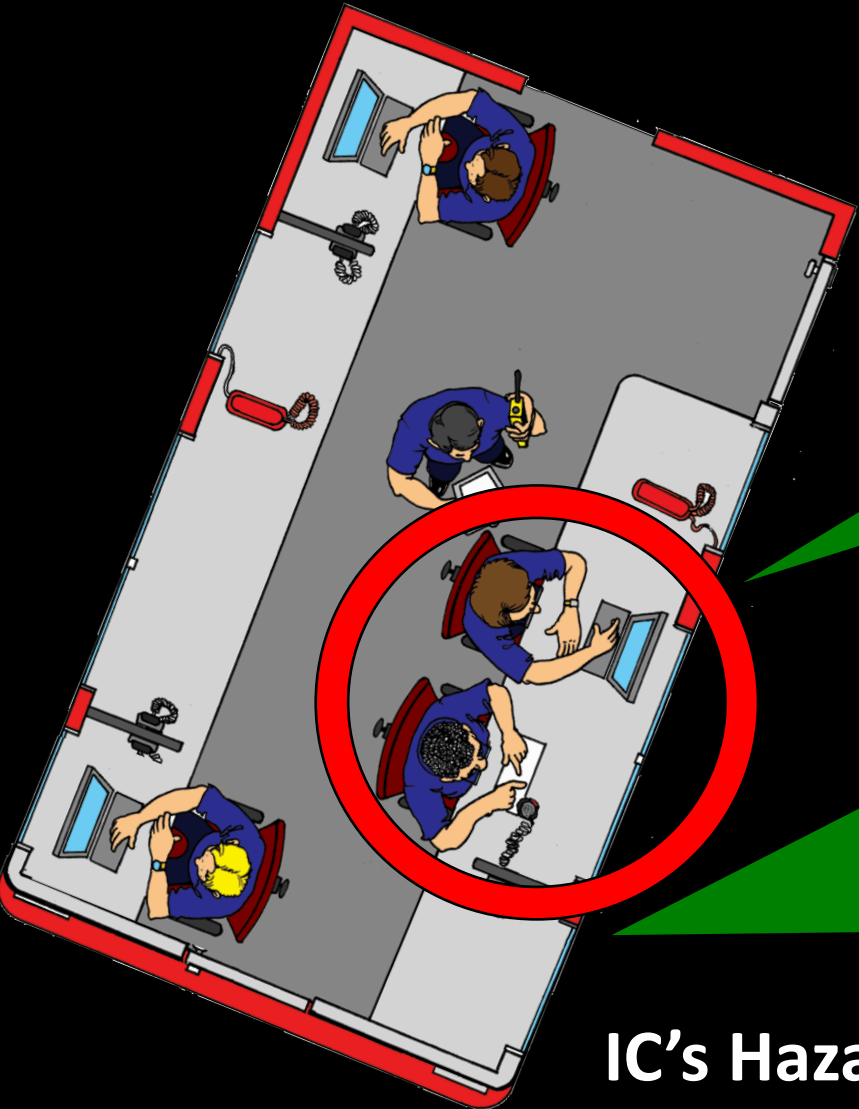


- Can manage multiple radio channels required for larger-scale operations
- Keeps all hazard zone companies and the IC on the same, single channel.
- Logistics channel is where Level 2 Staging and Rehab operate.
- Safety channel for the safety officer and division safety officers.

Escalating command is **not** another transfer of command.

It is providing additional support to the current IC and support officer.

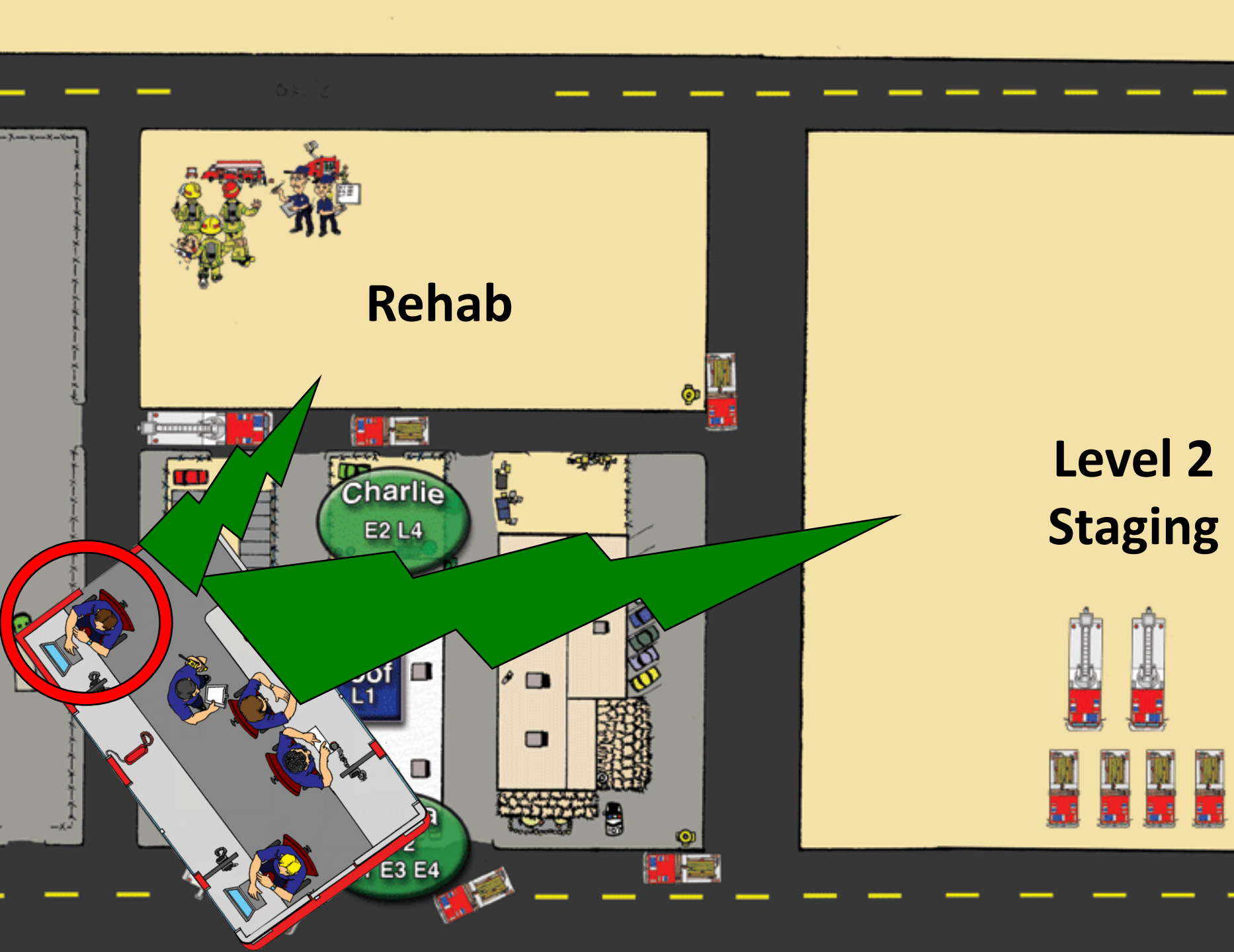




IC's Hazard Zone
Radio Channel

Mayday Channel





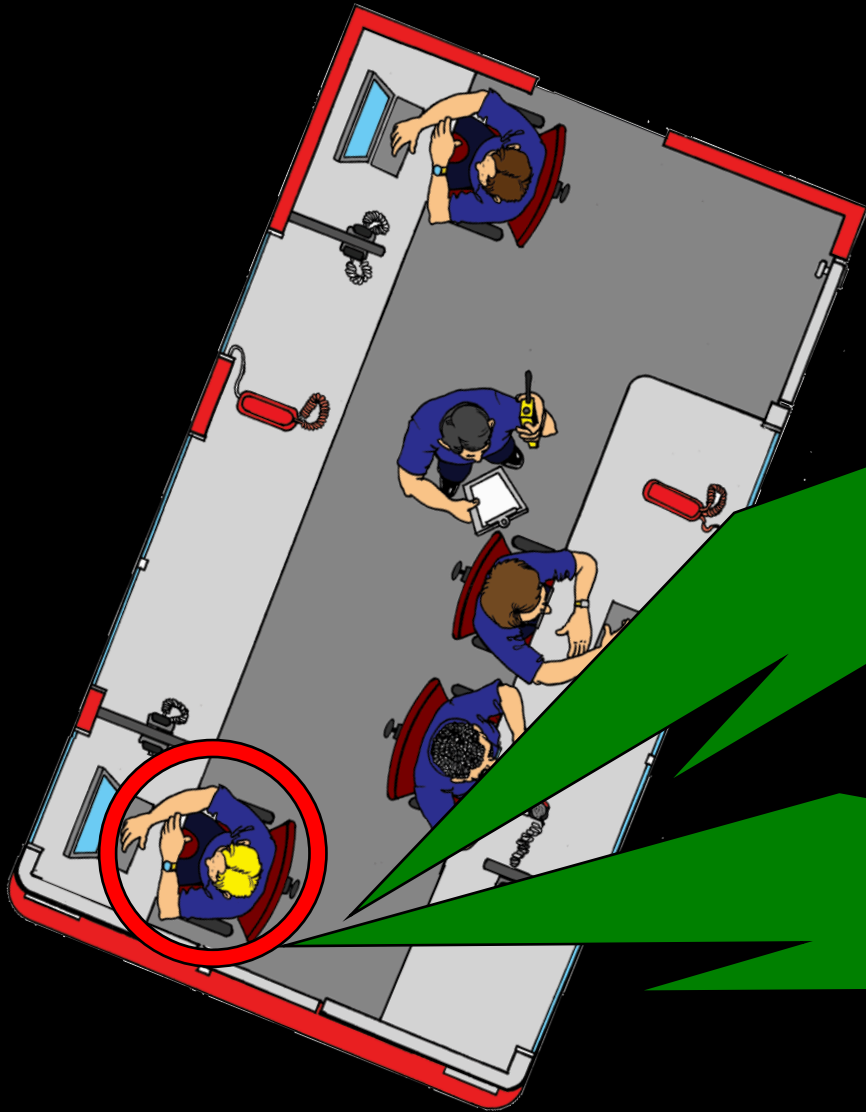
Logistics Radio Channel



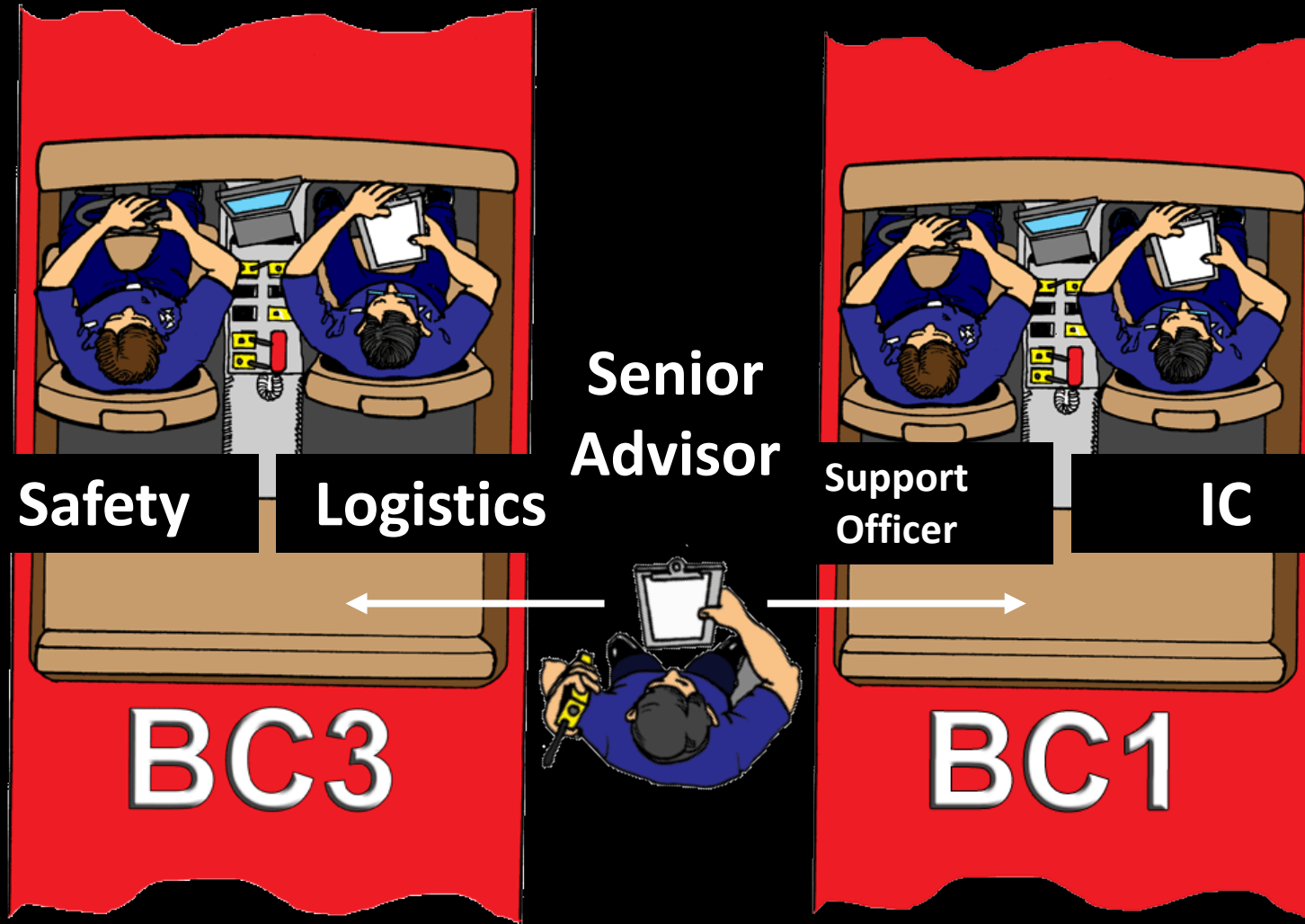
**What happens if
the IC listens to
multiple
channels at the
same time?**

1. Tactical
2. Logistics
3. Mayday





Safety Radio
Channel



The same command team
operating with two SUVs

**Match and balance command with the size,
structure, complexity, and duration of the incident**



**How would you organize
to manage this incident?**



Limited Staffing

- Limited staffing for task level action.
- Lack of task level supervisors (company officers).
- Lack of tactical level supervisors.
- Lack of staff to provide the IC with a support officer.
- Lack of staffing for a command team.

Who has these problems?



March 25, 2025, at 04:37 East County Fire & Rescue

14,000 ft² House

Multiple Vehicles

4 Acre Vegetation Fire

Spot Fires

Multiple Exposures

20+ mph Wind

Hydrant >6 mi Away

1st Arriving Engine Staffing of 2

IC #1 Engine 91 Captain

IC #2 Vancouver BC 2

Division Alpha ECFR Chief 91

Water Supply Group Camas Washougal BC 41

Structure Protection Group Vancouver BC 1





Fire Safety Academy

GARDEN APARTMENT FIRE NEAR MISS INCIDENT IN COBB COUNTY, GEORGIA

Study of Firefighter Line of Duty Injuries and Near Miss Incidents



Aug 17, 2023

🕒 55 mins

Garden Apartment Fire Near Miss Incident in Cobb County, GA

📍 Fire Dynamics, Suppression, Ventilation, Near Miss/Line of Duty Death



Firewall

Cobb County Near Miss/Injury Report

Bravo 1
Exposure

Common
Stairwell

Main Fire
Occupancy

Stratford Ridge Apartments
2560 Delk Road SE
Marietta, Georgia
February 9, 2022, at 05:25

**Main Fire
Occupancy
Floor 1**

**Charlie 1
Exposure**

Fire Wall

**Bravo/Charlie 1
Exposure**

**Bravo 1
Exposure**

**Analysis of a Near Miss in a Garden
Apartment Fire – Georgia 2022**

Jason Floyd
Daniel Madrzykowski

Fire Safety Research Institute
UL Research Institutes
Columbia, MD 21045

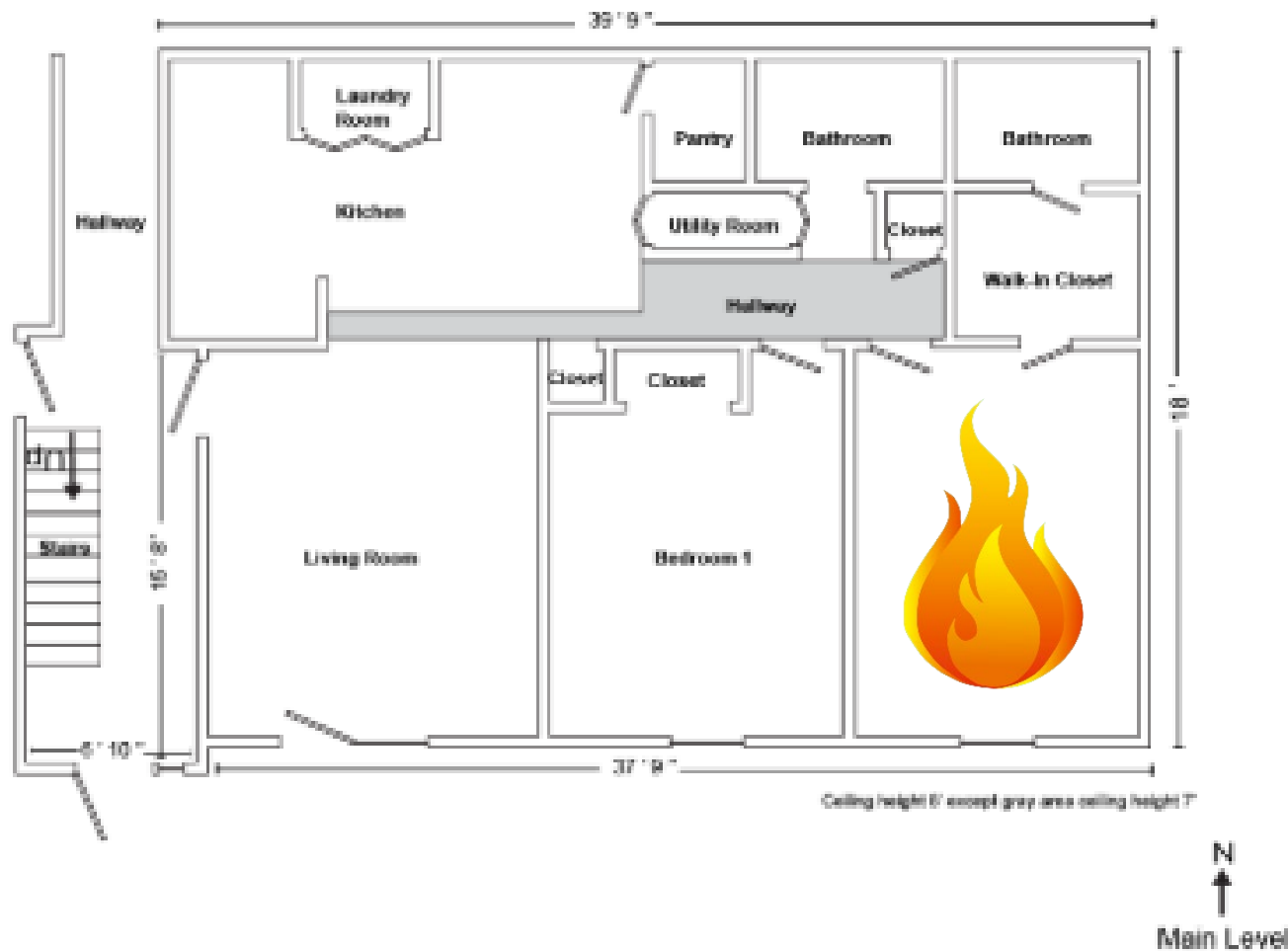
October 3, 2022

This publication is available free of charge from:
<https://dx.doi.org/10.54206/102376/RSFD6862>



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Analysis of a Near Miss in a Garden Apartment Fire – Georgia 2022

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Daniel Madrzykowski
Fire Safety Research Institute
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Columbia, MD 21045
October 3, 2022

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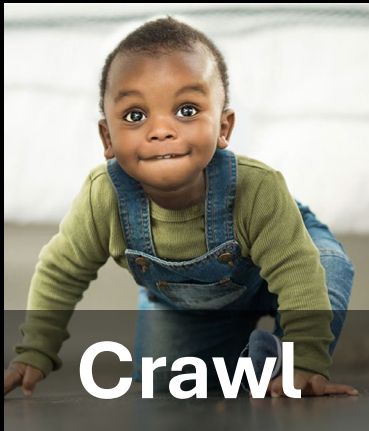




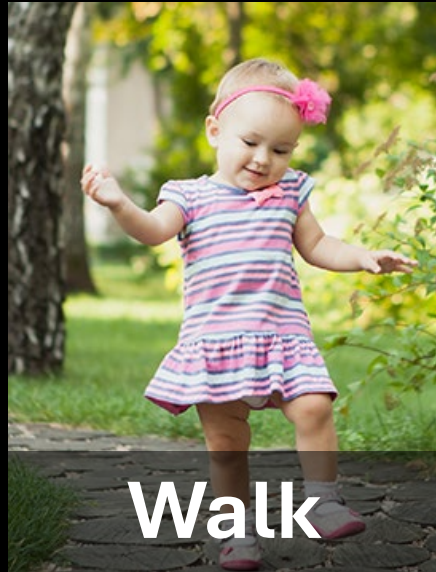
FIRE SAFETY ACADEMY

**Garden Apartment Fire Near Miss
Incident in Cobb County, Georgia**
training.fsri.org

Escalating Command



Crawl



Walk



Run



Run Faster

“If you can't fly then run, if you can't run then walk, if you can't walk then crawl, but whatever you do you have to keep moving forward.” - Martin Luther King, Jr.



Questions?

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