**TOPIC:** ENTRAPMENT AVOIDANCE

**TIME FRAME:** 2:30

**LEVEL of INSTRUCTION:** Level II

**TERMINAL LEARNING OBJECTIVE:**
At the end of this topic, a student, given principles of LCEs, protocols for negotiating an unsafe assignment, valid trigger points, fireline conditions, will be able to determine escape routes and safety zones when engaging a fire, so that human factors that contribute to fireline decision errors are managed with fireline conditions and utilization of requires safety zones for maximum personnel safety considerations.

**ENABLING LEARNING OBJECTIVES:**
1. Describe the role that LCES has in the Risk Management Process
2. Describe a protocol for negotiating an unsafe assignment
3. Define trigger point and levels of engagement
4. Identify a set of fireline conditions and determine valid trigger points
5. Describe a procedure for recognizing escape routes and safety zones when engaging a fire
6. Identify a set of fireline conditions and determine the minimum safety zone size
7. Describe human factors that contribute to fireline decision errors
8. Determine the appropriate level of engagement as conditions change with a given scenario

**MATERIALS NEEDED:**
- Writing board/pad with markers/erasers
- Appropriate audiovisual equipment and screen
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:**
The intent of Entrapment Avoidance is two-fold: 1) to examine the decision processes for engagement/disengagement on the fireground and 2) to examine factors that determine effectiveness of escape routes and safety zones.
I. ENABLING OBJECTIVES

A. Part 1 - Decision Making
   1. Describe the role that LCES has in the Risk Management Process
   2. Describe a protocol for negotiating an unsafe assignment
   3. Define Trigger Point and Levels of Engagement
   4. Identify a set of fireline conditions and determine valid trigger points

B. Part 2 - Recognition
   1. Describe a procedure for recognizing escape routes and safety zones when engaging a fire
   2. Identify a set of fireline conditions and determine the minimum safety zone size

C. Part 3 - The Human Factor
   1. Describe human factors that contribute to fireline decision errors
   2. Determine the appropriate level of engagement as conditions change with a given scenario

II. WHERE DO WE START?

A. Skills To Avoid Entrapment
   1. Ability to gain good situation awareness
   2. Ability to anticipate fire behavior
   3. Ability to select effective strategy and tactics
   4. Ability to make decisions about when to engage a fire
   5. Ability to recognize good safety zones and escape route opportunities

NOTE: The focus of this program will be on the last two skills

What skills do we use to avoid entrapment?
B. Escape and safety
   1. Concept of escape has been in firefighting before the Rules of Engagement
   2. The really smart firefighter has an escape and safety contingency plan in place before engaging a fire

III. ENTRAPMENT AVOIDANCE PART 1: DECISION-MAKING
A. Key decision points for avoiding entrapment
   1. Decide when and where you engage the fire
   2. Accept a new assignment and engage the fire with planned suppression actions
   3. Continue those suppression actions when changes have occurred

B. Risk decision options for engaging a fire
   1. Engage fire with planned assignment
   2. Negotiate the assignment
   3. Turn down the assignment

C. Rules of Engagement
   1. The rules of engagement have been a part of firefighting doctrine since 1958

APPLICATION

When do firefighters consider safety zones and escape routes?

How do you avoid entrapment on the fireline?

What options would you consider for a new fireline assignment?

When were the Rules of Engagement a part of firefighting doctrine?
2. For better or worse, firefighting has become more complex and so have the Rules of Engagement

D. Risk Management

1. The risk management process is a procedural approach to using the rules of engagement that you already know
2. It supports your decision-making on the fireline

E. LCES

1. LCES is one part of the Rules of Engagement
2. L, C, E, and S are the key operational actions that are in the Fire Orders
3. LCES is the MINIMUM level of hazard control that MUST be in place before making the decision to engage a fire

F. The right to know

1. Federal law says all workers have the right to know about the hazardous materials they work around
2. Questions all firefighters have the right to know the answers to
   a) What are the hazards I face?
### PRESENTATION

b) Where do I go to be safe from those hazards?
c) How do I get there?
d) When should I go there?

### APPLICATION

ACTIVITY:

(10 minutes)

Is There Legitimate Dissent?

Classroom discussion questions:

- Do leaders have a responsibility to protect their firefighters from unnecessary risk?
- Have you ever been given a fire assignment that you thought was unsafe or excessively risky?
- How did you resolve the situation?

G. Risk decision for changing situations

1. New fireline assignment decision points
   a) Engage fire with planned assignment
   b) Negotiate assignment
   c) Turn down assignment

2. Situational change decision point
   a) Continue full engagement

What options would you consider for a situation change on the fireline?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>b) Hold in place</td>
<td>What safety practices would you put into place?</td>
</tr>
<tr>
<td>c) Change tactics</td>
<td></td>
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<tr>
<td>d) Disengage and retreat</td>
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<tr>
<td>3. Safety practices</td>
<td></td>
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<tr>
<td>a) Lookout observation</td>
<td></td>
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<tr>
<td>b) Communications</td>
<td></td>
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<tr>
<td>c) Re-evaluate escape routes and safety zones</td>
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<tr>
<td>H. Trigger points</td>
<td></td>
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<tr>
<td>1. A pre-identified or anticipated event that when it occurs, initiates a pre-planned response</td>
<td>What is a trigger point?</td>
</tr>
<tr>
<td>2. Evaluate the situation and make a decision</td>
<td>What does hitting a trigger point mean?</td>
</tr>
<tr>
<td>3. Evaluation is Step 5 of the Risk Management Process</td>
<td>What changing factors can affect our mission and safety?</td>
</tr>
<tr>
<td>4. Trigger points are anticipated by</td>
<td>What are some trigger point examples for the fire environment?</td>
</tr>
<tr>
<td>a) Trends in weather</td>
<td></td>
</tr>
<tr>
<td>b) Changes in fuel type and terrain</td>
<td></td>
</tr>
<tr>
<td>c) Tactical progress</td>
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<tr>
<td>d) Logistical support</td>
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</tbody>
</table>
5. Trigger point examples for the fire environment
   a) Wind direction switches
   b) Rapidly dropping Relative Humidity (RH)
   c) Wind and slope come into alignment
   d) Combination RH & wind speed threshold exceeded
   e) Daily transition time of surface fire to torching

   Can you think of any others?
   What are some trigger point examples for fire operations?

6. Trigger point examples for fire operations
   a) Loss of lookout
   b) Loss of communication
   c) Escape time increases
   d) Failure to meet performance standards
   e) Air support diverted
   f) Excessive fatigue

   Can you think of any more?
   Are all trigger points created equal?

7. Trigger points will vary by geographic area and fuel type

   What things should you do on a fire so you are able to identify valid trigger points?

8. Identifying valid trigger points
   a) Get a good briefing
### Levels of engagement

1. **Validate**, continuing with full engagement of the fire
   - a) Continue full engagement
   - b) Hold in place
   - c) Change tactics
   - d) Disengage and retreat

2. Implement your pre-planned response
   - a) Continue full engagement
   - b) Hold in place
   - c) Change tactics
   - d) Disengage and retreat

3. **Hold in place**
   - a) Stop advancing or pull back a short distance
     1) Buys time to re-assess
     2) Fireline can be improved
     3) Troops can regroup
     4) Escape time can be shortened
     5) Allows for faster re-engagement

4. **Change tactics**
   - a) Disengage from the fire, change tactics and re-engage the fire
     1) Line location can be improved

### ACTIVITY:

**Trigger Point**

Lead the class through the activity on the following slides:

What do you do when a Trigger Point is hit?
## INCIDENT COMMAND SYSTEM
AH-330 Strike Team/Task Force Leader – All Hazards

### PRESENTATION

<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>2) Hazardous areas can be avoided</td>
</tr>
<tr>
<td>3) Direct versus indirect line can be considered</td>
</tr>
<tr>
<td>4) Negotiate changes within the chain of command</td>
</tr>
</tbody>
</table>

### DISENGAGE AND RETREAT

5. Disengage and retreat
   a) Move directly to a safety zone
      1) Immediate and full activation of all components in the LCES system
      2) Extreme situations may require crews to drop gear in order to move faster

### LEADER’S RESPONSIBILITIES

6. Leader’s responsibilities

   a) Communicate a clear change order to your firefighters
   b) Account for all your firefighters
   c) Insure your firefighters change engagement as planned
   d) Communicate the information to adjacent resources and up the chain of command
   e) Insure an experienced firefighter with a radio is the last person out during a retreat (most probably you)
   f) Re-assess the situation and re-brief before re-engaging the fire

### IV. ENTRAPMENT AVOIDANCE PART 2: RECOGNITION

A. Escape Route & Safety Zone Recognition

   What responsibilities do leaders have when they initiate a change in the level of engagement?

### How do we recognize effective escape
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> A process to use</td>
<td>routes and safety zones so we can make those decisions?</td>
</tr>
<tr>
<td>a) Observe the area</td>
<td></td>
</tr>
<tr>
<td>b) Visualize fire spread</td>
<td></td>
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<tr>
<td>c) Identify valid safety zones</td>
<td></td>
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<tr>
<td>d) Time the escape</td>
<td></td>
</tr>
<tr>
<td>e) Inform others</td>
<td></td>
</tr>
<tr>
<td>f) Evaluate conditions</td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong> Observe the area</td>
<td>What observations do you want to make?</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>a) Personally observe potential safety zones and escape routes in the work area</td>
<td></td>
</tr>
<tr>
<td>b) Situation Awareness is step 1 of the Risk Management Process</td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Visualize fire spread</td>
<td></td>
</tr>
<tr>
<td>a) Build a mental picture of the fire behavior you would expect</td>
<td></td>
</tr>
<tr>
<td>b) Anticipate flame lengths</td>
<td></td>
</tr>
<tr>
<td>c) Anticipate convective influences</td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong> Identify valid safety zones</td>
<td></td>
</tr>
<tr>
<td>a) Compare the fire behavior you visualize with the size and location of potential safety zones you observe in order to identify any true safety zones available</td>
<td></td>
</tr>
<tr>
<td>b) Hope for the best; plan for the worst case scenario</td>
<td></td>
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<tr>
<td><strong>5.</strong> Time the escape</td>
<td>How can you judge the time it will take to get</td>
</tr>
</tbody>
</table>
## PRESENTATION

### 6. Inform others

- a) Have someone walk and time the route
- b) Make notes on possible hazards along the route

### 7. Evaluate conditions

- a) Face to face is the best form of communication
- b) Give clear instructions and make sure they are understood
- c) Communicate the location and path of travel to those who work for you and adjoining resources
- d) Flag or otherwise mark the escape route or safety zone

## APPLICATION

### to a potential safety zone?

- How do you inform your personnel of LCES considerations?

### How often do you evaluate your escape and safety plan?

- B. What is a Safety Zone

### Evaluation is step 5 of the Risk Management Process
What are the requirements for an effective safety zone?

1. Requirements for an effective safety zone
   a) Pre-planned before the fire is engaged
   b) Sufficient size to mitigate anticipated heat impact for expected number of firefighters without fire shelter use
   c) Located away from hazardous terrain features
   d) Other hazards mitigated
      1) Snags
      2) Rolling debris
      3) Vehicle traffic

2. Do you know where your Zone is?
   a) Three primary types of safety zones
      1) The black – used for direct attack, should be your first choice
      2) Natural features – used for direct and indirect attack
      3) Constructed sites – used primarily for indirect attack and urban interface fires

3. Location, Location, Location
   a) Heavy fuels
   b) Downwind

What other hazards would you need to mitigate?

What are the three primary types of safety zones?
**PRESENTATION**

c) Above the fire, in a chimney, or in a saddle
d) Fine fuels and burnout
e) Flank of the fire
f) Lowest ground

4. Radiant vs. Convective Heat

**APPLICATION**

What are the convective influences that can push lethal heat to surprising distances and increase safety zone size requirements?

a) Convective influences
   1) Wind and fire whirl activity
   2) Lifting effect of steep slopes
   3) Channeling effect of chimneys, saddles and narrow canyons

**ACTIVITY:**

Estimating Safety Zone Size

Lead the class through the activity on the following slides:

C. What is an Escape Route?
1. Requirements for an effective escape route
   a) Pre-planned before fire is engaged
   b) Escape time allows for a positive safety margin given the fire’s anticipated rate of spread
   c) Located so path of firefighter travel is away from the head of the fire
   d) No significant travel barriers
      1) Steep slopes
      2) Rocks
      3) Loose soil
      4) Dense vegetation

2. How far is it, anyway?
   a) Someone needs to walk it and time it
   b) Allow for at least 150% of an individual’s travel time to determine escape time for a full crew or multiple crews
   c) Allow even more time for effects of fatigue later in the shift
   d) Remember the slowest person/equipment

3. Uphill escape routes
   a) Avoid steep uphill escape routes
   b) Firefighter travel rates are significantly slower

What are the requirements for an effective escape route?
What other travel barriers should you consider?
How do you calculate escape time?
### Presentaion

<table>
<thead>
<tr>
<th>c) Fire travels faster uphill</th>
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<tbody>
<tr>
<td>4. Safety margin</td>
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</table>

#### Application

<table>
<thead>
<tr>
<th>What is the definition of a safety margin?</th>
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</thead>
<tbody>
<tr>
<td>a) Your safety margin is simply the time you estimate it will take the fire to spread to your location, minus your known escape time</td>
</tr>
<tr>
<td>1) This needs to be a positive number</td>
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<table>
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<tr>
<th>What is Safety Margin Paradox?</th>
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<tbody>
<tr>
<td>a) Firefighter escape time will increase during the burning period (fireline progress and fatigue)</td>
</tr>
<tr>
<td>b) Fire rate of spread will increase during the burning period</td>
</tr>
<tr>
<td>c) Safety Margin will decrease</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>How far away from my safety zone can I be and still have a positive safety margin?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) When fire environment conditions degrade, you must shorten escape time or even go to a less aggressive level of engagement</td>
</tr>
<tr>
<td>1) Escape times of 5-10 minutes may be required</td>
</tr>
<tr>
<td>b) When fire environment conditions improve, you can increase your escape time and become more aggressive in the level of engagement</td>
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</tbody>
</table>
## PRESENTATION

1) Escape times of 30-60 minutes may be acceptable

7. Adjusting LCES

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<tbody>
<tr>
<td>a)</td>
<td>When safety margins shrink below 5 minutes, it should be considered a standard trigger point</td>
</tr>
<tr>
<td>b)</td>
<td>Conditions on fires seldom remain constant</td>
</tr>
<tr>
<td>c)</td>
<td>You may need to adjust any or all parts of your LCES system several times during a shift to reflect changing conditions</td>
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## APPLICATION

- When should you adjust LCES considerations?

### V. ENTRAPMENT AVOIDANCE PART 3: THE HUMAN FACTOR

A. Escape and safety decision paths

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<table>
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<tbody>
<tr>
<td>1.</td>
<td>Decision point considerations if a trigger point is hit during a situation change</td>
</tr>
<tr>
<td>a)</td>
<td>Continue full engagement</td>
</tr>
<tr>
<td>b)</td>
<td>Hold in place</td>
</tr>
<tr>
<td>c)</td>
<td>Change tactics</td>
</tr>
<tr>
<td>d)</td>
<td>Disengage and retreat</td>
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</table>

- What are your decision point considerations if a trigger point is hit during a situation change?

- If you disengage and retreat, what options are available to you?

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<tbody>
<tr>
<td>2.</td>
<td>Options for disengagement and retreat</td>
</tr>
<tr>
<td>a)</td>
<td>Normal escape</td>
</tr>
</tbody>
</table>
1. Adequate safety zone
   - Life is good
2. Inadequate safety zone
   - Deploy shelter

b) Escape route cut off
1) Select a deployment site
2) No escape route in place
   - Select a deployment site

What would be some of the reasons for escape route problems?

3. Escape route problems
   a) Lookout observation error
   b) Communication of disengagement alarm error
   c) Escape time estimation error
   d) Failure to establish LCES

C. Entrapments = decision errors

1. Where entrapments most frequently occur
   a) Indirect or downhill fireline construction
   b) Small fires escaping initial attack fires

B. Fires don’t kill firefighters

1. Firefighter decision errors kill firefighters
2. Your decision-making and communication skills as a leader will determine the outcome
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>c) Isolated areas of large fires</td>
<td>Who is most frequently involved?</td>
</tr>
<tr>
<td>2. Those most frequently involved</td>
<td>When do entrapments typically happen?</td>
</tr>
<tr>
<td>a) Firefighters with less than 2 or more than 15 years of experience</td>
<td>Why do entrapments happen?</td>
</tr>
<tr>
<td>3. When entrapments typically happen</td>
<td></td>
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<tr>
<td>a) During the burning period</td>
<td></td>
</tr>
<tr>
<td>b) When a situation changes</td>
<td></td>
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<tr>
<td>4. Why entrapments happen</td>
<td></td>
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<tr>
<td>a) Low experience level with local factors</td>
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<tr>
<td>b) Distraction, especially due to fatigue or stress</td>
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<tr>
<td>c) Hazardous attitudes</td>
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</table>

D. The Bottom Line

1. This training session was an opportunity for each of us to assess how we approach firefighter safety and a forum to learn from others
2. No rules, standards, policies, or checklists will ensure your safety on the fireline
3. Maintaining awareness of your situation and using fundamental firefighting methods are the foundation for safe and effective fireline operations

Student Activity 4-2-1, High Meadows
SUMMARY:

This training session was an opportunity for each of us to assess how we approach firefighter safety and a forum to learn from others. No rules, standards, policies, or checklists will ensure your safety on the fireline. Maintaining awareness of your situation and using fundamental firefighting methods are the foundation for safe and effective fireline operations.

EVALUATION:

The student will complete a written quiz and activities at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read the appropriate section(s) in the student supplement in preparation for the upcoming quiz. Study for the next session.