

Aerial Apparatus Fireground Operations

Instructor Guide

Session Reference: 1

Topic: Aerial Apparatus Fireground Operations

Level of Instruction:

Time Required: 3

Materials:

References:

- Truck Company Fireground Operations, Second Edition, Chapters 2, 8, And 11
- Essentials Of Fire Fighting, Third Edition, Chapter 8

PREPARATION:

Motivation:

Objective (SPO): 1-1

The student will demonstrate a basic understanding of safe aerial operations, aerial apparatus positioning, and setting up and operating elevated streams.

Overview:

Aerial Apparatus Fireground Operations

- Introduction to Aerial Operations
- Apparatus positioning
- Rescue using aerial apparatus
- Ventilation using aerial apparatus
- Hose operations using aerial apparatus
- Elevated streams

Session 1

Aerial Apparatus Fireground Operations

- SPO 1-1 The student will demonstrate a basic understanding of safe aerial operations, aerial apparatus positioning, and setting up and operating elevated streams.
- EO 1-1 Describe the various types of aerial or elevated apparatus and the general uses of each.
- EO 1-2 Describe basic aerial apparatus positioning requirements at the fire scene.
- EO 1-3 Describe the various techniques for rescue using aerial units.
- EO 1-4 Describe the techniques of using aerial units to ventilate a structure.
- EO 1-5 Describe the techniques of using aerial units to support fire streams.
- EO 1-6 Explain the tactical use of an elevated stream.

I. Introduction to Aerial Operations (1-1)

NOTE: The information related to aerial units is included for operational and tactical consideration. The operation of the aerial unit is usually the responsibility of the aerial unit driver/operator. This course is not intended to address the specific requirements related to operating the aerial unit.

- A. Each general type of aerial unit
 - 1. Aerial ladder
 - 2. Extending or telescoping platform
 - 3. Articulating platform
- B. Best type unit depends on operation for which used most often and makeup of territory
 - 1. Aerial ladder and extending platform give greater angular reach for given length
 - 2. All three types versatile
 - a. Rescue - removing occupants, lowering injured to ground, and placing crews on upper floors
 - b. Ventilation - placing crews on roofs and upper floors, knocking out windows
 - c. Attack lines - access to building, hoisting lines to crews in building, positioning lines for use as portable standpipe
 - d. General access - augmenting or replacing stairways and fire escapes
 - e. Hoisting - derrick to hoist sections of hose, tools, fans, appliances, and other equipment

- f. Elevated streams - general fire fighting and exposure coverage

II. Apparatus Positioning (1-2)

A. Approach

1. Approach is more difficult as unit gets closer to fire building
2. Advance in slow, deliberate manner
3. Officer-in-charge should be concerned with getting good position
4. Must not commit unit until in proper position

B. Positioning

1. Not essential to be positioned directly in front or rear on one- and two-story building
2. Should not block access to hydrants or protective systems
3. Allow access to taller buildings
 - a. Engine should pull past building when truck and engine coming from same direction
 - b. Engine should stop short when truck and engine coming from opposite directions
 - c. Width of building and fire conditions may solve positioning problem
 - d. May require positioning for elevated streams

C. Front and rear coverage

1. Must be addressed in standard response procedures
2. Entire building should be checked as soon as possible
3. First arriving truck should be assigned front
4. Second arriving truck to rear
5. Assignment modified according to situation
6. Rear assignment does not mean truck must be driven to rear; crew must check rear
7. One crew should check rear on single truck responses
8. Through pre-fire inspection and planning, know area for access to rear

D. Other aspects

1. Assign interior coverage as part of standard response procedures
2. Coverage operations must be coordinated with other apparatus

E. Size-up information

1. Objective of coverage operation is to gather information for size up
2. Report information promptly to company officer
3. Information should be precise and accurate
4. Report negative situations

5. Number of personnel available affect how much can be done at one time
6. Additional resources may be required

III. Rescue Using Aerial Apparatus (1-3)

A. Spotting the turntable

1. Goal is to get turntable into position that allows aerial unit to be used most effectively
 - depends on number and location of victims and wind direction
2. When victims at single window or several windows close together, spot turntable closest to victims
3. If wind blowing across front of building, locate turntable upwind of victims
4. If fire upwind of victims, spot turntable in best possible position to get victims quickly
5. Upwind turntable position more important when fire issuing from windows below victims - if available, direct hoseline at fire
6. When victims located some distance from each other, spot turntable between them
7. Sometimes, aerial ladder can be positioned so that victims can be removed from two or more floors at once
8. In some cases, aerial positioned at corner to permit coverage of two sides

B. Raising the aerial unit

1. Once spotted and stabilized, aerial unit raised toward victims in most danger

- a. Normally people closest to fire
 - b. In some cases, occupants in danger from heat, smoke, and gases
 2. Other consideration is victims at higher stories above where aerial unit is placed
 - a. People are panicky
 - b. Establish visual or verbal contact
 - c. Smoke can obscure occupants' view
 - d. Trapped occupants in most peril are those endangered by own mental state
 3. Aerial ladder tip aimed at or just above sill or railing and extended to building
 4. Aerial platform extended horizontally toward window will or balcony railing or up to it from below
 5. When distance and height permits, aerial unit first raised well above victims with basket or tip dropped down in final approach
- C. Placing the ladder or platform
1. Ladders
 - a. If ladder tip extended above window sill or balcony or fire escape railing, will get in way of victims and fire fighters assisting them
 - b. Ladders extended into window might block to much window opening
 - c. Ladder tip should be placed just at or slightly above window sill or railing

- d. Situation more acute when occupants trapped on fire escape or balcony directly over fire - ladder should be raised on side of fire escape or balcony least exposed to fire
- e. In final approach, tip of ladder should be placed against wall to three feet above railing

2. Platforms

- a. Top rail of basket should be placed about even with or slightly below window sill or fire escape or balcony railing
- b. When balcony or fire escape above fire, platform should be raised on least exposed side with top rail of basket placed even with railing

D. Imperfectly spotted turntable

- 1. Ladders - when only one beam of ladder makes contact with window sill, fire escape, or balcony, tip of beam should be placed above and about six inches from balcony railing during final approach
- 2. Platforms - when only one corner of basket contacts balcony or fire escape, top rail of basket should be placed bit higher than balcony railing

E. Removing trapped people

- 1. Ladders
 - a. If possible, at least one fire fighter should assist trapped people onto ladder
 - b. Conscious, able adults should be allowed to climb down ladder

- c. If available, one fire fighter should precede people down ladder to ground
 - d. Small children and anyone unconscious or injured must be carried down - backup fire fighter should precede fire fighter carrying victim
 - e. When occupants must be removed from two or more locations, ladder should be kept at first location until all victims have climbed down
 - f. Ladder should not normally be moved while anyone is climbing on it
 - g. If rotating ladder will place it within safe reach of others attempting to get out of building, it should be positioned for them
 - h. If fire situation bad, fire fighters might not be able to climb up ladder to keep victims from overloading
 - i. When loading might exceed manufacturer's recommendations, ladder should be supported from below with ground ladders
 - j. Ladder might have to be supported when it makes small angle with ground
2. Platforms
- a. At least one fire fighter should be assigned to make sure trapped occupants do not overload platform
 - b. When some people must remain in building while basket makes trip down, operator should move basket upward first and then away from building

- c. Fire fighter with unconscious victim should hold victim in basket until they reach ground
- d. Young children should be held or carried until descent is completed
- e. Unconscious victims should be sent down before conscious victims
- f. Fire fighters in building must be careful not to overload basket

F. Removing victims by litter

1. Ladders

- a. Ladder extended two or three rungs
- b. Lifeline passed under bottom rung of bed section
- c. Line passed up over ladder and dropped down between first and second rungs of fly section
- d. Hose roller placed over rung helps prevent wear and tear on rope
- e. Line tied to sling on litter under ladder
- f. As ladder raised, rotated, and extended, rope fed up ladder to hold litter in position
- g. Guideline attached to litter prevents spinning
- h. Ladder raised and adjusted until litter can be pulled in through window or onto roof, fire escape, or balcony

- i. Once litter in position, lifeline should be doubled, tied securely to bottom rung of bed section, and monitored
 - j. When litter ready to be lowered, pull ladder away from building or extend it slightly to take up slack
 - k. Rotate ladder away from building and retract until litter contacts ground
2. Platforms
- a. Litter can be raised in basket
 - b. Litter should be laid across and tied to basket

G. Lifeline anchor

1. Might be used when one or more victims trapped at rear of building and aerial unit cannot be positioned to reach them
2. With aerial ladder, lifeline should be tied to rung closest to point of contact with roof
3. With platform, lifeline should be secured to strong member of basket or boom assembly
4. Lifeline taken across roof to far side and dropped down

NOTE: Ladder belts should not be used for control descent of rescuers or removal of victims. Action rescue and removal of victims should be accomplished by personnel who have training in this area

IV. Ventilation Using Aerial Apparatus (1-4)

A. Removing windows

1. One fire fighter on aerial ladder or in basket can quickly knock out row of windows with pike pole
2. Fire fighter should be secured with ladder belt
3. Fire fighter should be placed to one side of window even with sill
4. If wind a factor, placement should be on windward side
5. When more than open window must be opened and wind blowing across face of building, first window opened should be one furthest downwind

B. Venting with streams

1. Initial size up indicates that it would be extremely dangerous to place venting crew on roof
2. Windows on top floor can be raked out with hose stream from aerial unit
3. Solid streams should be used
4. Ladder tip or basket should be placed away from building
5. Furthest downwind window should be knocked out first if wind blowing across face of building

C. Venting with an aerial ladder

1. Position and sequence

- a. Turntable can be spotted for maximum effectiveness
 - b. When wind blowing across face of building and exposures located close to downwind side, turntable should be spotted just upwind of closest exposure
 - c. If building relatively wide, apparatus should be positioned closer to center of building
 - d. Window furthest downwind should be opened first and ladder worked back into wind
 - e. If next lower floor also to be opened with ladder, top floor should first be opened completely
2. Knocking out windows
- a. First step in knocking out double hung window is to extend ladder tip through upper section
 - b. Ladder should be extended far enough to push away obstructions
 - c. After tip extended into upper section, ladder should be lowered to break through window frame and glass in lower section
 - d. Extend ladder tip through top center of picture window and then lower to sill to clean out most glass
 - e. Operator must constantly observe ladder tip to make sure proper penetration into window and be able to retract promptly if it becomes engulfed in flame

- f. Be extremely careful not to damage ladder while using for venting
 - g. If ladder is extended too far into window, it might jam into ceiling and get stuck
 - h. Ladder can be damaged if operator tries to break through window frame made of steel or some other strong material
 - i. If window must be approached from acute angle, only inside truss should be used to break glass
 - j. Precautions must be observed when narrow windows are being knocked out
 - k. Ladder tips should never be forced through opening
3. Safety
- a. Large amounts of glass and debris will fall to ground
 - b. Shards of glass and chunks of debris can slide down ladder
 - c. In strong winds, shards of glass can scale good distance - know building is being vented and stay clear of immediate area
 - d. Timing especially important if windows over entrances must be knocked out
 - e. Crews caught unexpectedly in shower of glass and debris should keep heads down and arms close to sides - do not look up and move close to wall, seek protection in doorways and under overhangs, and proceed when safe

V. Operations Using Aerial Apparatus (1-5)

A. Lifting personnel and equipment

1. When crews climb ladder carrying line, tip of ladder should be placed even with sill of window - to one side
2. Entire window might have to be removed to provide sufficient access
3. Remove window if opening not large enough to allow easy entry
4. Section of hose can be tied to ladder before raising
 - a. Nozzle, center of hose, and first coupling tied to first rung
 - b. If additional hose needed, carry rope and hose roller to hoist it
5. Can be used to lift sections of hose to fire fighters already in building
6. Hose and appliances can be lifted in baskets
7. Aerial lift usually must faster than climbing and carrying equipment, especially above third or fourth floor

B. Using hose as portable standpipe

1. Platform raised to window or balcony and hose connected into outlet
2. Ladder used to haul one end of 2-1/2- or 3-inch hose up in building
3. Hose should be pulled onto floor and secured to window sill

4. Operations can be carried out with water thief
5. Portable standpipes increase effectiveness of operations when fire floor is not more than two or three stores above maximum reach of aerial unit

VI. Elevated Streams (1-6)

A. Introduction to Elevated Streams

1. One of most important uses of aerial unit is to provide elevated stream for attack or exposure protection
2. Can be effectively directed into or onto upper parts of tall buildings
3. Also useful on large, sprawling structures, outside storage yards, piers, ships and other areas where height and reach provide access to fire or exposure
4. Pipe should be equipped with several diameters of solid stream nozzles and at least one large-caliber fog nozzle

B. Setting Up Aerial Pipe

1. Spotting turntable
 - a. Aerial pipe may have to be operated with truck in unfavorable position - spotted for rescue or venting
 - b. Aerial pipe operations may begin upon arrival

c. Buildings

- (1) Where wind not a factor, turntable should be spotted for maximum coverage of fire area - usually center of building
- (2) If building is fairly wide, unit should be spotted in middle of involved area
- (3) When wind blowing across face of building so that nearby structures exposed, turntable should be spotted between fire and exposures

d. Open storage areas

- (1) When wind not a factor, turntable should be spotted for maximum coverage of fire area
- (2) When wind a factor, turntable should be spotted at flanks of fire between main body and exposures
- (3) Unit should not be positioned directly in path of fire
- (4) Also used to protect fire fighters advancing handlines toward fire - turntable should be spotted either behind or at flanks of advancing fire fighters and streams directed just ahead of fire fighters

e. Flammable liquid handling facilities

- (1) Turntable should not be spotted in line with either end of horizontal tanks

- (2) Unit should be positioned at side and stream used to cool tank as well as attack main body of fire
2. Developing water supply
 - a. Pipe water supply most often developed in cooperation with engine companies
 - b. Pumper should be positioned close to truck due to high friction loss and flow requirements
 - c. Joint operations should be practiced
 3. Rigging aerial pipe
 - a. Platform pipes
 - (1) Permanently mounted to aerial platform
 - (2) Water supply connected to intake siamese
 - (3) Platform raised, and pipe released, aimed, and charged
 - (4) Pipe should be charged before basket moved toward fire
 - (5) Platform pipe stream and spray system under basket available to protect fire fighters in basket
 - (6) Fire fighters in basket should wear life belt connected to side rail
 - b. Bed-mounted ladder pipes
 - (1) Pipe permanently mounted to bed section of ladder

- (2) Water supply connected to intake siamese
- (3) Halyard attached to pipe for vertical control from turntable - turntable rotated for lateral movement
- (4) Nozzle released from holder, ladder raised to position, and pipe charged

c. Ladder-tip pipes

- (1) Place pipe on ladder with proper nozzle for fire and wind conditions - must be positioned dead center and locked down securely
- (2) For additional safety, pipe can be tied to ladder rungs
- (3) Ladder pipe hose connected to pipe
- (4) Attach handle and halyard for vertical control (NOTE: pipe should not be operated from tip of ladder) - rotate ladder to move nozzle laterally
- (5) Siamese connected to ladder pipe hose and supply lines connected to siamese - should be shut-off valve between ladder pipe hose and siamese if siamese not gated
- (6) Ladder raised, and pipe aimed and charged - pipe should be charged before moved toward fire
- (7) Fire fighter operating halyards should be positioned on turntable

C. Aerial Streams for Fire Attack

1. Nozzles

- a. Fog streams more effective if can reach seat of fire
 - b. Solid streams have longer reach and can penetrate further
 - c. Both fog and solid nozzles rated according to water flow in gallons per minute - either type will lose effectiveness if not supplied with at least rated flow
 - d. Pipe should be fitted with proper size as well as proper type of nozzle
2. Stream placement
- a. To direct fog stream through window, place nozzle at approximate center of opening and set at 30-degree angle
 - b. Aim at upper part of room where concentration of heat greatest and then sweep downward
 - c. Place solid stream nozzle so stream enters window at upward angle to allow stream to strike ceiling, break up, and spread water over wide area
 - d. Direct solid stream straight into window when maximum penetration most important consideration
 - e. Never direct stream at floor from position above window
 - f. To be most effective, stream should be moved horizontally back and forth across fire area - also move up and down for maximum coverage

- g. In heavy smoke, look for steam and white smoke as indications that stream penetrating fire area
 - h. If visual check not feasible, listen for sound of stream hitting building and look for heavy water runoff
- 3. Wind and thermal updraft effects
 - a. Sometimes aerial stream adversely affected by thermal updraft
 - b. Might also be affected by wind blowing across stream or toward aerial unit
 - c. If fog stream broken up by winds or thermal updrafts, adjust nozzle to narrower pattern
 - d. Consider moving nozzle very close to building or, if fire situation prevents this, replace fog nozzle with large solid stream nozzle
- 4. Weakened structures
 - a. If structure shows signs of having been weakened, aerial unit must be moved away
 - b. If fog stream is being used, check to see if stream is reaching; if not, replace with solid nozzle
- 5. Shutdown - aerial streams should be used only as long as fire, stream, or white smoke visible in area covered by streams
- 6. Improper use of streams
 - a. Roof holes

- (1) Aerial streams should not be directed into hole burned through roof or opened for venting
- (2) To protect roof from ignition, direct stream onto roof near opening
- (3) When roof collapses, could be that only aerial streams able to control fire in area of collapse

b. Interior handlines

- (1) Aerial streams should not be directed into area in which crews operating with handlines
- (2) When properly coordinated, aerial streams can be used in conjunction with handlines
- (3) Adequate ventilation increases effectiveness and decrease hazards of coordinated operations

D. Aerial Streams for Exposure Coverage

1. Outside Exposures - spaces between buildings and unpierced fire walls major deterrents to exposure fires
2. Exposure hazards
 - a. Crews must be familiar with potential exposure problems
 - b. Should also be cognizant of factors that affect severity of outside exposure problem
 - (1) Recent weather
 - (2) Present weather, especially wind

- (3) Spacing between fire and exposures
 - (4) Building construction materials and design
 - (5) Intensity and size of fire
 - (6) Location of fire
 - (7) Availability and combustibility of fuel
 - (8) Size of fire force
 - (9) Fire fighting equipment on hand
- c. Worst combination would be recent dry weather, strong winds blowing toward exposures, area of closely space frame buildings, severe fire difficult to reach, plenty of easily ignited materials located between fire building and exposures, limited personnel and apparatus response on first alarm, and poor water supply
 - d. First alarm assignments should be reviewed periodically for fire force and equipment response
 - e. Where exposure hazards great, number of companies responding on first alarm should be increased
3. Exposure protection
- a. Choosing the stream
 - (1) Fog streams more effective than solid streams for exposure protection
 - (2) Solid streams should be used when distance, wind, or thermal updraft a factor

- (3) Greater intensity of fire, heavier the aerial exposure stream needed
- (4) If water supply a problem, smaller, adequately supplied, stream more effective than weak stream from larger nozzle

b. Directing the stream

- (1) Since water transparent, radiant heat passes through it
- (2) Stream must be directed onto surface of exposure in such way that it washes down side
- (3) If exposed building taller than fire building, most vulnerable area above level of fire - first exposure stream should be directed just above most vulnerable area
- (4) Burning embers and ignited materials can be convected up to exposures
- (5) Aerial stream directed into fire and its smoke column can decrease exposure hazard
- (6) Exposure stream can be alternately directed onto exposure and fire
- (7) When exposure so long that one stream cannot protect it completely, attempt must be made to position second stream

E. Elevated Handlines

1. Operating from a platform

- a. Handline with nozzle should be tied to platform railing before platform raised - nozzle and one foot of hose should extend out in front of railing
 - b. Do not raise platform until nozzle operator secured to railing with ladder belt
 - c. If stream directed in through window, place basket so nozzle at center slightly below bottom part of window
 - d. Once fire in area of window knocked down, basket can be moved above sill to allow horizontal penetration
 - e. When fire thoroughly knocked down, handline can be advanced into building
2. Operating from an aerial ladder
- a. Usually elevated handline directed through window
 - b. If fire showing at window, ladder should be raised but not placed close to building
 - c. Fire fighter operating nozzle should take line up ladder to proper position and tie to center of ladder
 - d. Nozzle should be centered in window just below sill
 - e. If no fire showing, place ladder at window before fire fighter takes line up ladder
 - f. Fire fighter working on ladder must wear ladder belt

- g. Ladder operator must be careful not to activate the extension-retraction control when rotating ladder
- h. Elevated stream can be untied and move into building when fire at window is knocked down
- i. In some situations, handline operated from ladder while ladder pipe in operation above

NOTE: The instructor may want to demonstrate particular techniques with aerial units prior to the students practicing those techniques during practical application.

SUMMARY:

Review:

Aerial Apparatus Fireground Operations

- Introduction to Aerial Operations
- Apparatus positioning
- Rescue using aerial apparatus
- Ventilation using aerial apparatus
- Hose operations using aerial apparatus
- Elevated streams

Remotivation:

Assignment:

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EVALUATION: