AERIAL OPERATOR

Participant Guide

April 2016

STATE OF CONNECTICUT
DEPARTMENT OF EMERGENCY SERVICES
AND PUBLIC PROTECTION
COMMISSION ON FIRE PREVENTION
AND CONTROL
CONNECTICUT FIRE ACADEMY
34 PERIMETER ROAD
WINDSOR LOCKS, CT 06096-1069

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www.ct.gov/cfpc

Aerial Operator Student Syllabus

Required Text:

- IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition
  Fire Protection Publications, ISBN: 978-0-87939-571-1

Optional Text:

- IFSTA Pumping and Aerial Apparatus Driver/Operator Exam Prep 3rd Edition
  Fire Protection Publications, ISBN: 979-0-87939-572-8

- Exam Prep Fire Department Apparatus Driver/Operator 2nd Edition
  Jones and Bartlett Publisher ISBN: 13-978-0-7637-8598-7

Required PPE: Participants are required to have all PPE excluding SCBA for outside activities.

Tentative Class Schedule: (100% attendance is mandatory for course completion)

Day 1 Date: / /

- Pre-class assignment: Read IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition, Chapters 2, 3, 15 (pgs. 515-517), 16.
- A.M. Introduction and Sessions 1 and 2
- P.M. Sessions 3,4 and HOT Apparatus Inspection
- Post-class assignment: Take the review quizzes for Chapters 2, 3, 16.

Day 2 Date: / /

- Pre-class assignment: Read IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition, Chapter 18
- A.M. Session 5
- P.M. HOT Stabilizing Apparatus
- Post-class assignment: Take the review quiz for Chapter 18, Photograph the out rigger controls, pedestal controls, Bucket controls (if applicable) and the PTO controls of your Aerial Device

Day 3 Date: / /

- Pre-class assignment: Read IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition, Chapter 19.
- A.M. Session 6
- P.M. HOT Stabilizing and Aerial Movements
- Post-class assignment: Take the review quiz for Chapter 19.

Day 4 Date: / /

- Pre-class assignment: Read IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition, Chapter 17
- A.M. Session 7
- P.M. HOT Positioning and Tip Placement
- Post-class assignment: Take the review quizzes for Chapter 17

Day 5 Date: / /

- Pre-class assignment: N/A
- A.M. HOT Scenarios
- P.M. HOT Scenarios and Operating Elevated Master Streams
- Post-class assignment: Catch up on all reading

Day 6 Date: / /

- Pre-class assignment: Read IFSTA Pumping and Aerial Apparatus Driver/Operator Handbook 3rd Edition, Chapter 20
- A.M. Session 8 and Class review
- P.M. HOT Scenarios
- Post-class assignment: Exam Prep.

Final Written Exam Date: / /

Time:

Location:

Session 1
Outline

History

A) Initial elevated needs
   1) Upper floor access
      a) Portables
      b) Scaling ladders
   2) Elevated Master Streams
      a) Flowed from surrounding buildings
B) First dedicates apparatus were ladder carrying devices
   1) Transported Hooks and Ladders
C) First attached devices
   1) Ladders that were hand raised
D) Water Towers
E) Natural evolution
   1) Metal, springs, hydraulics, platforms, detachable ladder-pipes, bed-pipes, telescoping waterways
F) First Snorkel
   1) Chicago
G) Buckets and Aerials merge
H) Tip-loads increase
I) Today's Hybrids

NFPA

A) NFPA 1901 Standard for Automotive Fire Apparatus
   1) In 1991 there was a major rewrite to this standard and many safety features were subsequently mandated
      a) Tip Loads
      b) Interlocks
      c) Seatbelts
   2) Chapter 8 Aerial Fire Apparatus
      a) Defines portable ladder compliment
         (i) (See attachment)
      b) Defines tools to be carried
         (i) (See attachment)
         (ii) Integrated power equipment
            - *Hydraulic pump*
            - *Generator*
               (i) Most times larger than a portable generator
      c) Storage, pump, and detachable Ladder-Pipe requirements
   3) Chapter 9 Quint Fire Apparatus
      a) Defines the five features that make a Quint

(i) Aerial device
(ii) Pump
(iii) Tank
(iv) Hose
(v) Portable ladders
- *Quints only need to carry one extension ladder*

4) Chapter 19 Aerial Devices
   a) 50 feet or more in length, measured from the ground to the top rung or top of the handrail with the device at full extension and full elevation
   b) Equally spaced rungs between 11 ¾ - 14 inches apart
      (i) Each rung to be able to support 500lbs.
   c) The device shall be a minimum 18 inches wide with hand rails at least 12 inches high
   d) Interlock requirements
   e) Minimum capacity for Aerials of 250lbs. unsupported at full extension and any elevation (dry)
      (i) Capacity increases in 250lb. increments
   f) Minimum capacity for Platforms of 750lbs. unsupported at full extension and any elevation (dry)
      (i) Wet 500lbs.
   g) Bucket requirements
      (i) Min. 14sq. feet floor area
      (ii) Floor drains
      (iii) Heat reflective shield
      (iv) Water curtain system
      (v) Inward opening gates
      (vi) 4 inch kick plate
   h) Device operational parameters
      (i) Tower ladders 110' or less need to raise from the bedded position to fully extended, fully raised and rotated 90 degrees within 150 seconds
      (ii) Aerial Ladders
   i) Operating station requirements
   j) Stabilizers to not exceed 75lbs per square inch when fully deployed
   k) Communication systems required from the tip to the pedestal
5) Annex D
   a) It is recommended that apparatus greater than 15 years old, which have been properly maintained, be placed into reserve status

B) NFPA 1911 Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus
1) Chapter 19 Performance Testing of Aerial Devices
   a) Requires Destructive Testing annually
   b) Requires Non-Destructive Testing every five years
   c) This chapter outlines the parameters for load testing and recertification

C) NFPA 1002 Fire Apparatus Driver/Operator Professional Qualifications
1) Chapter 6 Apparatus Equipped with an Aerial Device

a) Outlines the Knowledge and Skills Aerial Driver/Operators are responsible to know

2) Annex A Driving maneuvers for D/O's (See attachment)

a) Alley-Dock

(i) Apparatus bay parking is a good alternative to Alley-Dock Backing

b) Diminished Clearance

(i) Tests the ability to drive in a straight line in tight spaces stopping 6" from the cone

c) Serpentine

(i) Done on a open level area with three cones in a straight line spaced 30'-38' apart

(ii) This represents maneuvering the apparatus around parked cars both forward and in reverse

d) Confined Space Turn-Around

(i) Tests the ability to turn around in tight spaces

(ii) Simulates changing your direction of travel

D) NFPA 1500

1) Requires annual medicals for D/O

2) Requires Seatbelts in Apparatus and Mandates their use

3) Mandates records be kept for apparatus maintenance

E) NFPA 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments

1) Chapter 7 Occupational Medical Evaluation of Members

a) Outlines the physical requirements Driver/Operators are mandated to meet.

(i) These include vision and hearing standards

Types of Devices

A) Aerial Ladders

1) Standard Truss construction

a) Steel

b) Aluminum

(i) Welded or riveted joints

2) Tip-Loads range from 250lbs. to 750lbs.

B) Telescoping Booms

1) Welded Steel box beam with an *escape ladder attached to the top*

2) Tip-Loads range from 250lbs. to 750lbs.

3) Some of these models are the one exception to the cantilever design rule

C) Telescoping Platforms (Tower Ladders)

1) Box-beam or truss box construction

2) Buckets mounted on the end

3) Tip-Loads 750lbs. and up

4) All have pre-piped waterways that can flow 1000gpm and up

D) Aerial Ladder Platforms (Ladder Towers)
    1) Standard Truss construction
        a) Steel
        b) Aluminum
            (i) Welded or riveted joints
    2) Buckets mounted on the end
    3) Tip-Loads 750lbs. and up
    4) All have pre-piped waterways that can flow 1000gpm and up
E) Articulating
    1) Box-beam booms
        a) Joined in the middle by the “knuckle”
    2) Buckets mounted on the end
    3) Tip-Loads 750lbs. and up
    4) All have pre-piped waterways that can flow 1000gpm and up
F) Hybrids
    1) Combine features of several different types of devices
    2) Box-beam
    3) Articulating
    4) Tip-Loads 750lbs. and up
    5) All have pre-piped waterways that can flow 1000gpm and up
    6) All have very large stabilization footprints
G) Aerial Ladder single chassis
    1) Single rear axle
    2) Dual rear axle
H) Aerial Ladder Tractor Drawn or Tillered
I) Mid-Mount
J) Rear-Mount

Case Study Summary

Date: April 8,2008

Department: Lawrence Park Volunteer Fire Department

Location: Harborcreek Pa.

NIOSH Report Number: F2008-12

Apparatus used during incident:

1994 75' Aerial with a 1000gpm rated pre-plumbed waterway.

Activities being performed at time of Incident:

Defensive Firefighting Operations

Incident details:

After arriving at the scene of a fire in an Industrial building, it was determined to use an elevated master stream to attack the fire. The nozzle on the apparatus was normally kept in the rescue position and a Probationary member was sent up to pin the nozzle at the tip of the device. Once a water supply was secured the Aerial was elevated and extended and it was noted that the nozzle was still positioned at the second fly section of the Aerial. It was pre3ssumed the proby did not adjust the nozzle position and the decision was made to operate the master stream from that position. As the waterway was charged the last section of the waterway and the nozzle under the waters pressure, "launched" off the end of the Aerial and traveled 75' before dropping to the ground. It was estimated that the assembly (weighing over 200lbs.) was traveling 30mph when it reached the tip of the Aerial. Deputy Chief Michael D. Crotty was struck in the head by the falling debris and suffered fatal head trauma. Crotty was 24 at the time of the accident.

Corrective actions:

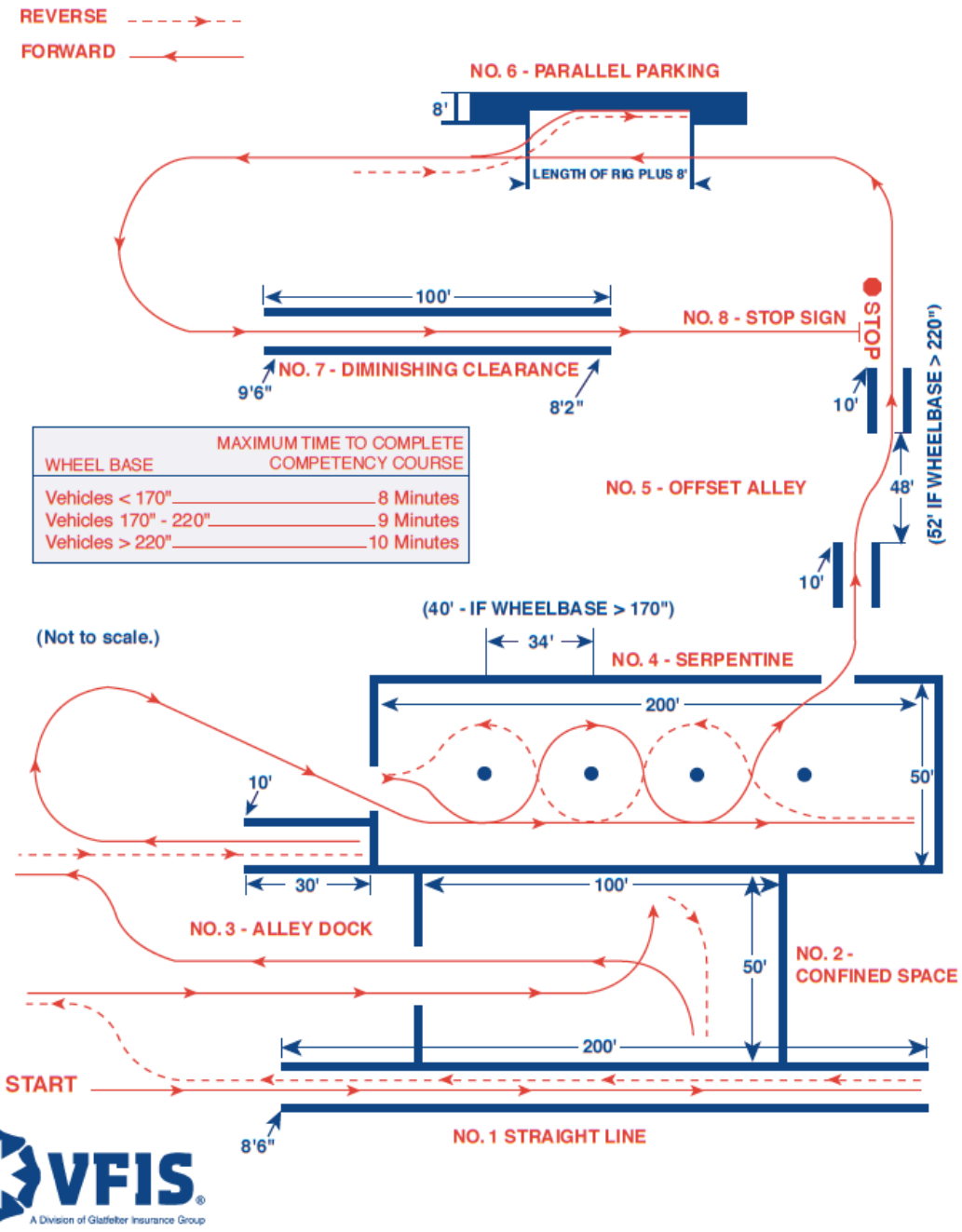
NFPA 1901 Ground Ladder Requirements for Aerial Apparatus

8.7.1* A minimum of 115 ft (35 m) of fire department ground ladders shall be supplied and installed by the contractor.
8.7.2* As a minimum, the following types of ladders shall be provided:
(1) One folding ladder
(2) Two straight ladders (with folding roof hooks)
(3) Two extension ladders

NFPA 1901 Tool Requirements for Aerial Apparatus

8.8.2*Aerial fire apparatus shall be equipped with at least the following equipment:
(1) Two 6 lb (2.7 kg) flathead axes mounted in brackets fastened to the apparatus
(2) Three 6 lb (2.7 kg) pickhead axes mounted in brackets fastened to the apparatus
(3) Four pike poles mounted in brackets fastened to the apparatus
(4) Two 3 ft to 4 ft (1 m to 1.2 m) plaster hooks with D handles mounted in brackets fastened to the apparatus
(5) Two crowbars mounted in brackets fastened to the apparatus
(6) Two claw tools mounted in brackets fastened to the apparatus
(7) Two 12 lb (5 kg) sledgehammers mounted in brackets fastened to the apparatus
(8) Four portable hand lights mounted in brackets fastened to the apparatus
(9) One approved dry chemical portable fire extinguisher with a minimum 80-B:C rating mounted in a bracket fastened to the apparatus
(10) One 21⁄2 gal (9.5 L) or larger water extinguisher mounted in a bracket fastened to the apparatus
(11) One SCBA complying with NFPA 1981, Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services, for each assigned seating position, but not fewer than four, mounted in brackets fastened to the apparatus or stored in containers supplied by the SCBA manufacturer
(12) One spare SCBA cylinder for each SCBA carried, each mounted in a bracket fastened to the apparatus or stored in a specially designed storage space(s)
(13) One first aid kit
(14) Six salvage covers, each a minimum size of 12 ft Å~ 18 ft (3.6 m Å~ 5.5 m)
(15) Four combination spanner wrenches mounted in brackets fastened to the apparatus
(16) Two scoop shovels mounted in brackets fastened to the apparatus
(17) One pair of bolt cutters, 24 in. (0.6 m) minimum, mounted in a bracket fastened to the apparatus
(18) Four ladder belts meeting the requirements of NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services
(19) One 150 ft (45 m) light-use life safety rope meeting the requirements of NFPA 1983
(20) One 150 ft (45 m) general-use life safety rope meeting the requirements of NFPA 1983
(21) Two 150 ft (45 m) utility ropes having a breaking strength of at least 5000 lb (2300 kg)

(22) One box of tools to include the following:
(a) One hacksaw with three blades
(b) One keyhole saw
(c) One 12 in. (0.3 m) pipe wrench
(d) One 24 in. (0.6 m) pipe wrench
(e) One ballpeen hammer
(f) One pair of tin snips
(g) One pair of pliers
(h) One pair of lineman's pliers
(i) Assorted types and sizes of screwdrivers
(j) Assorted adjustable wrenches
(k) Assorted combination wrenches
(23) Two or more wheel chocks, mounted in readily accessible locations, that together will hold the apparatus, when loaded to its GVWR or GCWR, on a hard surface with a 20 percent grade with the transmission in neutral and the parking brake released
(24) One traffic vest for each seating position, each vest to comply with ANSI/ISEA 207, Standard for High-Visibility Public Safety Vests, and have a five-point breakaway feature that includes two at the shoulders, two at the sides, and one at the front
(25) Five fluorescent orange traffic cones not less than 28 in. (711 mm) in height, each equipped with a 6 in. (152 mm) retroreflective white band no more than 4 in. (102 mm) from the top of the cone, and an additional 4 in. (102 mm) retroreflective white band 2 in. (51 mm) below the 6 in. (152 mm) band (26) Five illuminated warning devices such as highway flares, unless the five fluorescent orange traffic cones have illuminating capabilities
(27) One automatic external defibrillator (AED)


REVERSE
FORWARD
NO. 6 - PARALLEL PARKING
8'
LENGTH OF RIG PLUS 8'
100'
NO. 8 - STOP SIGN
STOP
NO. 7 - DIMINISHING CLEARANCE
9'6"
8'2"
10'
48'
(52' IF WHEELBASE > 220")
NO. 5 - OFFSET ALLEY
10'
(40' - IF WHEELBASE > 170")
34'
NO. 4 - SERPENTINE
200'
50'
10'
30'
100'
NO. 3 - ALLEY DOCK
50'
NO. 2 -
CONFINED SPACE
200'
START
8'6"
NO. 1 STRAIGHT LINE
(Not to scale.)
WHEEL BASE
MAXIMUM TIME TO COMPLETE COMPETENCY COURSE
Vehicles < 170" 8 Minutes
Vehicles 170" - 220" 9 Minutes
Vehicles > 220" 10 Minutes
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Session 2
Outline

Aerial Design

A) Two Basic types of Aerial Deign
   1) Truss Construction
   2) Box Construction
B) Standard Aerial Ladders
   1) Give Fire Departments the ability to reach and access elevated positions and flow water from an elevated master stream
   2) Some models have detachable or replaceable tips
   3) This feature allows departments to replace the last few feet of a device that has become damaged without replacing the entire device or section
   4) Aerial Ladders are best suited for remote master stream operations and upper floor and roof access
   5) Most times Aerial Ladders are faster to set up and operate than Platforms
C) Platform Devices
   1) Provide for the ability to safely man a master stream from an elevated position
   2) These devices are designed to ferry individuals from grade level to an elevated position and vise versa
   3) Platforms are attached to the end of the telescoping or articulating portion of the device and have leveling systems which keep the working platform level
   4) These devices provide stable and effective working space that can be moved and adjusted as the situation and needs dictate
   5) Platform control stations vary in design and features included in the system
   6) Most all modern devices are designed to operate as cantilevers
      a) Supporting the tip in most cases does not strengthen the device, it actually weakens it
B) Devices are mounted on top of the apparatus and connected to it through the turn table
   1) This link connects the aerial device to the internal torque box frame in the apparatus, which is connected to the stabilizing system
C) Modern devices are metal and operated hydraulically
D) Turntable Assembly
   1) Sits on large sheer type ball bearings
   2) With the Master rotation gear around it
E) Cradle
   1) Is the brace which the Aerial device rests in while in the bedded position
F) Torque Box
   1) Is the structural component which connects the Aerial Device, Apparatus Frame and the Stabilizer system

G) Angle of approach
1) Is the angle from the front tires to the lowest point on the front of the apparatus

H) Angle of departure
1) Is the angle from the back of the back tires to the lowest point on the rear of the apparatus

Aerial Device Components and Functions

A) In-Cab components and gauges
1) Speedometer
2) Tachometer
3) Fuel Gauge
4) Exhaust Fuel Gauge
5) Fuel Pressure Gauge
6) Oil Pressure Gauge
7) Voltmeter
   a) Measures the amount of voltage stored in the Battery
8) Ammeter
   a) Measures what is going into or out of the Battery
   b) I.e. Alternator charging, or starting draw
9) Air pressure gauge
10) Transmission Oil temperature gauge
11) Engine temperature gauge
12) Hour meter
   a) Engine
   b) PTO
13) PTO switch
   a) Usually located on the dash
   b) Engaged either hydraulically, pneumatically or electronically
   c) Hot shift PTO can be engaged when the device is in neutral
14) Master Ladder Switch
15) Front Brake Lock

B) Engine and electronic components
1) Batteries
   a) Supply power to the apparatus
   b) Produce hydrogen gas which can explode
2) Load monitors
   a) Manage the load to the electric system and insure the system will not over load the system
      (i) This is accomplished by "shedding" some loads

C) Outrigger controls
1) Control valves for stabilizer cylinders
2) Interlock indicator lights
3) Short-Jack switch

4) EPU Switch
5) Fast Idle Switch
6) Diverter Valve
7) Level Indicator

D) Pedestal Controls

1) Control valve levers for (most go from left to right as follows)

a) Extension cylinders
b) Rotational motor
c) Elevation cylinder (hoisting)

2) High Idle Switch
3) Rotation Override Switch
4) EPU switch
5) Platform Control Switch
6) Master Stream Controls
7) Engine Start
8) Engine shut off
9) Air horn
10) Rung alignment indicator
11) Cradle alignment indicator
12) Hydraulic Pressure gauge
13) Inclometer
14) Flow gauge
15) Air Capacity

Hydraulics

A) The lifeblood of the Aerial Device
B) All Aerial Device movements are made with Hydraulics
C) System Components
1) Fluid
2) Reservoir
3) Pump
4) Hoses
5) Valves
6) Pistons/Actuators

D) Fluid (what is used to transfer force within the Hydraulic System)

1) Hydraulic Oil

a) Can't be compressed
b) Very effective transfer of force
c) *In low temperature climates the viscosity of the fluid increases slowing the devices movements*
d) In Hotter climates thicker oil is sometimes used

E) Reservoir
1) Sizes 35-40 gallons on average
2) Excess fluid is stored there ready for immediate use

3) Level should be checked when the system is cold with the device and stabilizers bedded
    a) Level then can be rechecked while hot

F) Pump
1) Runs off a Power Take Off (PTO) from the engine
2) Creates the pressure that is then transferred throughout the system
    a) Pressure=Force, and it is constant throughout the system
    b) Flow=Speed, and it is divided by the number of movements being executed at any moment in time
3) Auxiliary Pump (AKA Emergency Power Units or EPU's)
    a) Used in case of primary pump failure
    b) *Restricted to bedding the device only*
    c) Most require 1 hour of cooling for every minute of use
    d) Some newer EPU's may be Air driven (pneumatic)

G) Hoses
1) Carry the Fluid throughout the device
2) Smaller hoses traditionally are the supply hoses
3) Larger Hoses are the return hoses
4) Most lines have a 5:1 safety ratio

H) Valves
1) How the D/O controls the flow of oil through the system
2) By starting, stopping and controlling the flow of fluid
3) Fly by Wire
4) Check Valves
    a) Insures Fluid does not drain from the system
    b) One-way valves
        (i) Insures fluid will not run backward through the system
5) Selector Valves
    a) Directs oil flow from one system to another
6) Relief Valves
    a) Prevent over-pressurization
7) Counter balance valves
    a) Prevents undesired movement or motion
8) Actuator valves
    a) Open and close flows
9) Monitor Valves
10) Stack Valves
11) Proportional directional control valves
    a) Controls the flow to multiple actuators

I) Pistons/Actuators
1) Turn oil pressure into movement
2) Single action Cylinders
    a) Power one direction and rely on gravity to return to the seated position
3) Dual action cylinders
    a) Make it possible for the cylinder to extend and retract under power
    b) Can receive pressure from either end

4) Hoisting Cylinders
    a) Raise the Aerial device making vertical movement possible
    b) Usually the largest Cylinders in the system
5) Stabilizer cylinders
    a) Take the load of the device and torque box and transfer it to the ground
    b) Horizontal pistons are much smaller than the vertical cylinders
6) Extension Cylinders
    a) Attached to a system of cables and pulleys to move all sections of the ladder proportionally
7) A hydraulic rotary motor controls rotation
    a) It rotates the turntable around the Rotation gear
    b) The turntable sits on large sheer type ball bearings
    c) Act as a brake for unwanted turntable rotation

Student Worksheet

Apparatus Manufacturer:_____ Year:_____

Type of Device:_____ GVW:_____

Rated vertical height of the device:_____

Rated horizontal reach of the device:_____

Rated tip-load of the device:_____

Oil pressure at startup:_____

Oil pressure at operating temperature:_____

Voltmeter reading at an idle:_____

Water temperature reading at operating temperature:_____

Air pressure when system is full:_____

Standby Hydraulic Pressure:_____

Operating Hydraulic Pressure (OHP) while rotating:_____

OHP while Extending:_____ Retracting:_____

OHP while Raising:_____ Lowering:_____

Width of the apparatus:_____

Distance stabilizers needs for full horizontal stroke:_____

Minimum distance from a building the device can be setup achieving full scrub area coverage:_____

Degrees side-to-side device has 100% capacity:_____

Degrees side-to-side device has 50% capacity:_____

Degrees front to back device has 100% capacity:_____

Degrees apparatus can correct side to side:_____

Limitations while flowing water:_____

_____

GPM capacity at tip:_____

PSI needed coming in to flow capacity at tip:_____

Friction loss in device:_____

Session 3
Outline

Driver/Operator

A) Cognitive Skills Needed
   1) Reading
   2) Writing
   3) Mathematics
B) Physical Fitness
   1) Annual physical required by NFPA 1500
   2) Vision and Hearing standards outlined in NFPA 1582
C) Mechanical aptitude
D) Computer literacy
E) Fire Ground Tactics
F) Leadership
G) Driver Selection
   1) Volunteer
   2) Career
      a) Testing
      b) Seniority
H) Driver Training Procedures
I) Driving Rules and Regulations
   1) Federal
      a) Q endorsement (Federal Exemption from Firefighters needing a CDL to operate fire apparatus)
   2) State
      a) CDL
   3) Municipal
   4) SOP
   5) Unless specifically exempt D/O are subject to all laws, ordinances, rules and regulations

Operator Discipline

A) Approx. 25% of Firefighter fatalities occur as a result of vehicle accidents
B) Collision avoidance
   1) Situational awareness
   2) Force = Mass x Acceleration
   3) Many accidents happen because the D/O misunderstands the capabilities of the apparatus
C) Five Factors that contribute to Accidents
   1) Improper Backing
   2) Reckless Driving
   3) Excessive Speed

4) Lack of Driving Ability
5) Poor Vehicle Design

D) Factors that impact Driver readiness
1) Substance Abuse
2) Personal Issues

E) Driver should ensure passengers are belted into seats
1) The exception to this is loading hose
a) Must have a safety observer
b) Members must be kneeling or sitting
c) Apparatus can only be moving forward on a closed road
d) Must also maintain a slow rate of speed

F) Tiller Training
1) Detachable seat
2) Belted in
3) Wearing Helmet

G) Backing up
1) Use Spotters
a) Two are preferred to one
b) Should stay visible in the left mirror
2) Warning lights
3) Backup alarm
4) Radios
5) Standard Hand signals
6) Back-up camera
7) *Currently there is no NFPA Standard for backing-up fire apparatus*

Driving

A) The D/O must know the vehicle dimensions to know were it will and will not fit
B) Lugging is when the accelerator is fully depressed and but the apparatus does not accelerate
C) Manual transmission apparatus should be down shifted to a lower gear for turns
D) Avoid roll-back when starting out with a standard transmission
E) Second gear should be selected in manual transmissions for descending steep hills
F) Shifting an Automatic transmission apparatus entails depressing the interlock and moving the shifter to the desired gear
G) Idling for extended periods in cold weather the idle should be advanced to 900-1100 RPM's
H) Engine Brakes and Retarders engage when pressure is taken off of the accelerator
I) Turbo seizure can occur if the engine is shut down immediately after full load operation
J) Braking distance for a car traveling 55 MPH is 165' a three axle truck traveling at the same speed takes approximately 390'
K) Braking distance is the distance the vehicle travels from when the brakes are applied to when the vehicle comes to a stop

L) The weight of the apparatus is a factor in trying to stop an apparatus
M) Stopping distance increases 3-15 times in snow and ice
N) Average D/O reaction distance at 45 MPH is 50'
O) Anti-Lock braking systems with traction control have switches for mud and ice
P) Out running the siren
Q) At 40 MPH a siren is audible 300' away
R) At 60 MPH a siren is audible 12' away
S) The D/O must account for all lanes of traffic in an intersection
T) At red lights and Stop signs the D/O must stop and insure the intersection is clear before proceeding
U) If they cannot they must come to a complete stop and do so
V) When multiple apparatus are taking the same route to an incident they should maintain a separation of 300'-500'
W) If a vehicle stops not leaving enough room to stop apply the brakes and move to the side to pass the vehicle preferably on the left
X) If the D/O must go into the oncoming side of the street to get through an intersection this should be done at a greatly diminished rate of speed
Y) Anytime the D/O must cross the centerline they must insure the oncoming lanes are clear
Z) Excessive weight transfer contributes to skidding and rollover
AA) Failing to anticipate obstacles is the most common cause of skids
BB) Driving too fast, failing to anticipate weight shifts and play in the steering also can cause skids
CC) If the apparatus does begin to skid steer the front tires the direction of the skid to regain control
DD) Defensive driving is being aware of what is happening all around you
EE) The tillerman while traveling forward should have both hands at the top of the wheel
FF) Jackknifing is when the cab and the trailer are less than 90 degrees from each other while moving
GG) *When making wide turn the tillerman should turn away from the turn at the time the front wheels reach the intersection*

Case Study Summary

Date: May 19,2007

Department: Waterbury Fire Department

Location: Waterbury Ct.

NIOSH Report Number: F2007-17

Apparatus used during incident:

1988 American Lafrance Engine (32,300 lbs.)
1999 Seagrave Rearmount Aerial (58,000 lbs.)

Activities being performed at time of Incident:

Responding.

Incident details:

Both units were responding to a reported kitchen fire. They were responding from different directions with audible and visual warning devices in full use. A chief was responding the same direction as L-1 and it is customary for the chiefs to block some intersections for the responding apparatus. On this particular response the chief entered the intersection to warn approaching vehicles of the responding fire truck. E-12 was entering the intersection from the opposite direction and thought the chief was blocking for their response. E-12 had a red light but proceeded into the intersection. Both apparatus arrived at the intersection at the same time. L-1 was traveling between 40-47mph and E-12 was traveling 18-25mph at the time of impact. All four firefighter in L-1 and two from E-12 were transported with serious injuries. The Driver and Officer of E-12 were thrown from the apparatus and suffered critical injuries. Captain John Keane succumb to his injuries the next day, he was 37.

Corrective actions:

Connecticut State Statute Regarding Emergency Vehicle Operation

Sec. 14-283. Rights of emergency vehicles. Obstruction of. (a) "Emergency vehicle", as used in this section, means any ambulance or vehicle operated by a member of an emergency medical service organization responding to an emergency call, any vehicle used by a fire department or by any officer of a fire department while on the way to a fire or while responding to an emergency call but not while returning from a fire or emergency call, any state or local police vehicle operated by a police officer or inspector of the Department of Motor Vehicles answering an emergency call or in the pursuit of fleeing law violators or any Department of Correction vehicle operated by a Department of Correction officer while in the course of such officer's employment and while responding to an emergency call.

(b) The operator of any emergency vehicle may (1) park or stand such vehicle, irrespective of the provisions of this chapter, (2) proceed past any red light or stop signal or stop sign, but only after slowing down or stopping to the extent necessary for the safe operation of such vehicle, (3) exceed the posted speed limits or other speed limits imposed by or pursuant to section 14-218a or 14-219 as long as such operator does not endanger life or property by so doing, and (4) disregard statutes, ordinances or regulations governing direction of movement or turning in specific directions.

(c) The exemptions herein granted shall apply only when an emergency vehicle is making use of an audible warning signal device, including but not limited to a siren, whistle or bell which meets the requirements of subsection (f) of section 14-80, and visible flashing or revolving lights which meet the requirements of sections 14-96p and 14-96q, and to any state or local police vehicle properly and lawfully making use of an audible warning signal device only.

(d) The provisions of this section shall not relieve the operator of an emergency vehicle from the duty to drive with due regard for the safety of all persons and property.

(e) Upon the immediate approach of an emergency vehicle making use of such an audible warning signal device and such visible flashing or revolving lights or of any state or local police vehicle properly and lawfully making use of an audible warning signal device only, the operator of every other vehicle in the immediate vicinity shall immediately drive to a position parallel to, and as close as possible to, the right-hand edge or curb of the roadway clear of any intersection and shall stop and remain in such position until the emergency vehicle has passed, except when otherwise directed by a state or local police officer or a firefighter.

(f) Any officer of a fire department may remove, or cause to be removed, any vehicle upon any public or private way which obstructs or retards any fire department, or any officer thereof, in controlling or extinguishing any fire.

(g) Any person who willfully or negligently obstructs or retards any ambulance or vehicle operated by a member of an emergency medical service organization while answering any emergency call or taking a patient to a hospital, or any vehicle used by a fire department or any officer or member of a fire department while on the way to a fire, or while responding to an emergency call, or any vehicle used by the state police or any local police department, or any officer of the Division of State Police within the Department of Public Safety or any local police department while on the way to an emergency call or in the pursuit of fleeing law

Session 4
Outline

Preventive Maintenance and Inspections

A) Define
   1) *Maintenance- The act of keeping something in the state of readiness or usefulness. Performed in accordance with manufacturers specifications.*
   2) *Repair- The act of replacing or restoring that which has become inoperable*
B) Regular Inspections
   1) *Begin on the approach to the apparatus looking for any and all fluid leaks*
   2) Apparatus
      a) Standard DOT apparatus pre-trip inspection
         (i) Including all fluids and filters
            - *As per SOP, SOG or Manufacturers specifications*
      b) Brake test
      c) Battery inspection
         (i) Checks for corrosion connections and electrolyte levels
      d) ¾ of a tank of fuel should be maintained at all times
      e) Inspection is made easier if apparatus is clean
      f) Proper lubrication minimizes time spent OOS
         (i) Lubrication is one of the prime objectives of good maintenance
         (ii) Follow manufacturers specifications
      g) D/O should document play in the steering wheel of more than 10 degrees
      h) Slack adjusters should be checked daily by the D/O
      i) Glass should be cleaned with warm soapy water or glass cleaner and paper towels
   3) Equipment
      a) All tools and equipment carried by the apparatus
      b) Pumps
         (i) Should be tested at 250 psi for three minutes
         (ii) The outside temp for pump testing should be between 0-100 degrees
         (iii) Pumps are required to deliver 100% of the rated capacity for 20 minutes
      c) Hydraulics
      d) Aerial Device
C) Aerial Inspection
   1) *Hydraulic Fluid levels (check first)*
      a) Check when cold
   2) Stabilizers
   3) Turntable
      a) Turn table bearing bolt should be checked periodically for manufacturers specification compliance
   4) Control Pedestal
   5) Communication System

6) Breathing Air System
7) Hoisting cylinders
8) Extension Cylinders
9) Rotation motor
10) Ladder Section
    a) *Welds with discoloration, disfigurement or deformities are signs of exposure to high heat and indicate heat damage*
11) Platform Assembly
12) Rungs
13) Wire Rope
14) Sheaves
15) Huck bolts on truss box construction
    a) More than 2 in a row missing and the device is to be taken out of service
16) Waterway
    a) *If the pressure gage on the waterway is more than 10 psi off it should be taken OOS*
    b) *Need to be tested while the device is at full extension, full elevation and flowed at the pressure needed to provide 1000 gpm's and 100 psi at the tip*
17) Avoid over cleaning and removing lubricant that is needed

D) Operational Check
1) Set up device
    a) Check all steps for proper function
    b) Fully Raise
    c) Fully extend device
    d) Rotate device both directions
    e) Test EPU
    f) Bed Device

E) Road Test
1) Per NFPA 1500 to be conducted on with the device at full service weight
2) Fully loaded Arial devices should accelerate to 35mph in 25 seconds
3) Tests should be conducted on dry flat roads

Ladder Testing

A) Types of Testing
1) Pre-Service
2) Acceptance
3) Performance
4) Annual Certification

B) Pre-Service Testing
1) Performed by Manufacturer
2) Not required by NFPA but most times meets the Standard

C) Acceptance Testing
1) Performed by accepting Department
    a) If the Apparatus Fails?

2) *In jurisdictions over 2000' above sea level engine overload tests should be conducted*

D) Performance Testing
   1) Is what the Operational Check falls under
   2) Intended to check for the operation and full performance of all Aerial components
   3) Is to be conducted in ideal temperature and road conditions

E) Annual Certification Testing
   1) Conducted most times by a third party organization
   2) Must meet the requirements of NFPA 1911
   3) *Destructive or Load Testing*
      a) *Conducted every year*
         (i) Must be conducted with wind speeds of less than 10mph
         (ii) Device must be able to support a static load 150% of the rated capacity
         (iii) Drift tests require the device to be fully elevated and extended 10'
   4) *Non-Destructive Testing*
      a) *Conducted every five years*
      b) Can Include
         (i) Magnetic Particle testing
         (ii) Conductive Testing
         (iii) Liquid Penetrating
         (iv) Ultra Sonic
         (v) Radio Graphic
         (vi) Hardness
         (vii) Acoustic Emission
      c) Ladder Pipe Clamping Device should be tested as well

Case Study Summary

Date: May 10, 1990

Department: Waterbury Fire Department

Location: Waterbury Ct.

NIOSH Report Number: N/A

Apparatus used during incident:

1974 Hahn Engine

Activities being performed at time of Incident:

Responding

Incident details:

While responding to an emergency, E-11 lost its brakes coming down a hill approaching a "T" intersection. The driver tried to make the turn but the apparatus hit a tree on the opposite side of the road. At the time of the accident the Engine was staffed with 5 personnel. All were injured in the crash; one member who suffered minor injuries began extricating the remaining crewmembers, two other crewmembers received critical injuries. Two Firefighters died as a result of injuries sustained in the crash, Firefighters Howard Hughes and Heriberto Rivera were both 29 at the time of the accident.

Corrective actions:

Case Study Summary

Date: 1/9/09

Department: Boston Fire Department

Location: Boston Ma.

NIOSH Report Number: F2009-05

Apparatus used during incident:

1995 E-One 110' Rearmount Aerial Ladder

Activities being performed at time of Incident:

Returning from an EMS run.

Incident details:

After Operating at an EMS run L-26 began returning to quarters when the Driver notified the Officer that the brakes were not responding. An attempt was made to place the apparatus in to neutral and apply the Maxi brake but there was no response from the braking system. At the end on a long hill was a "T" intersection, the driver hit two parked cars went through a brick wall, and came to rest with the front of the apparatus inside a brick multi story structure. The Chauffer was treated for serious injuries and two other firefighters received minor injuries. Lt. Kevin Kelly died as a result of injuries sustained at this accident; he was 52 at the time of the accident.

Corrective actions:

Air Brake Inspection
7-step air brake check

1.) Test low pressure warning system
Turn ignition on, release parking brake, and step on and off the brake pedal to reduce air tank pressure. The low air alarm must come on before the pressure drops to below 60 psi in the air tank.

2.) Check the spring brake
Keep reducing the air pressure in the tanks the parking brake should close (pop out) between 45-20psi. This causes the spring brake to come on.

3.) Check rate of air pressure buildup
When the engine is at operating rpms, the pressure should build from 85psi to 100psi within 45 seconds in dual air systems. If rig has large tanks this could take longer. Check manufacturers specs

4.) Check air leakage rate
With fully charged system +/- 125psi turn off engine but leave ignition on. Release the parking brake and apply steady pressure to the break pedal. After initial drop if the pressure falls more than 3psi in one minute there is a leak in the breaking system.

5.) Check air compressor cut in and out
Air compressor should start at about 100 psi and stop around 125psi. Run the engine at fast idle. Bleed brakes and watch for proper compressor cut in and watch the pressure build and observe proper pressure cut out.

6.) Test parking brake
Apply the parking brake and apply drive train pressure not to exceed 1000 rpms and ensure the parking brake holds.

7.) Test service brakes
At full air pressure release the parking brake and move apparatus to five miles per hour. Apply the service brake and insure operation observing any pulling to one side or the other.

Chapter 2 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Standard operating procedures (SOPs) for a systematic maintenance program should specify maintenance procedures, when they are performed, and: (30)

A. who is responsible.
B. bid sheets for repair procedures.
C. absolute costs for each procedure.
D. how often maintenance procedures can be skipped.

_____ 2. Who should perform repair work that involves complex tools, parts, or in-depth mechanical knowledge? (30)

A. Shift supervisor
B. Driver/operator
C. Senior firefighter
D. Certified mechanic

_____ 3. In which situation must immediate action be taken on apparatus maintenance and inspection issues? (31)

A. Whenever an issue is found, no matter how small
B. When the department does not have a back-up apparatus
C. When the average number of response calls is more than two per day
D. For serious issues or items meeting the NFPA® 1911 "Out-of-Service" criteria

_____ 4. Which of the following statements about vehicle cleanliness is MOST accurate? (32)

A. Exterior cleanliness is not important; only interior cleanliness matters.
B. Excessive vehicle cleanliness can often mask problems with the vehicle.
C. Modern pumping apparatus rarely need to be cleaned of dirt and grime.
D. Proper inspection of apparatus is easier when parts are free of dirt and grime.

_____ 5. When beginning a walk-around inspection, the driver/operator begins at the driver's door on the cab and works: (36)

A. in whatever pattern is comfortable.
B. around apparatus in a clockwise pattern.
C. around apparatus in a counterclockwise pattern.
D. by going back and forth to each side of the apparatus.

_____ 6. Tire selection for fire apparatus is based on: (38)

A. length of the apparatus.
B. gross axle weight ratings for the apparatus.
C. longevity of the apparatus and daily intended use.
D. cost parameters of the authority having jurisdiction.

_____ 7. Which of the following is a function of antilock braking systems? (43)

A. Enable the apparatus to stop much faster
B. Decrease both brake time and reaction time
C. Enable the driver/operator to focus on items other than braking
D. Reduce the possibility of an apparatus going into a slide during heavy braking

_____ 8. Apparatus brakes should be thoroughly tested ____ using methods outlined in NFPA® 1911. (43)

A. at least annually
B. at least every two years
C. a minimum of every three years
D. whenever any new tires are placed on the apparatus

_____ 9. Which of the following can cause charging batteries to be hazardous? (47)

A. Batteries can give off carbon dioxide, which is highly toxic.
B. Batteries can give off methane gas, which is highly explosive.
C. Batteries can give off hydrogen gas, which is highly explosive.
D. Batteries can explode violently when left on the charging station even a few minutes too long.

_____ 10. Which of the following statements about inspecting apparatus fire pumps is MOST accurate? (48)

A. Fire pumps need only be inspected if showing problems.
B. All items must be checked at the same time, either daily or weekly.
C. Some items should be checked daily, but other checks may be performed weekly.
D. All checks on fire pumps must be performed by mechanics, not driver/operators.

Directions: Write a brief answer to the questions below.

11. What are three items that should be checked when examining tires? (39)

_____

_____

_____

12. What is the difference between a load sequencer and a load monitor? (40)

_____

_____

_____

Chapter 3 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. In the United States, basic requirements for licensing a driver are established by the: (82)

A. Bureau of Highways.
B. Department of Transportation.
C. Federal Emergency Management Agency.
D. Occupational Safety and Health Administration.

_____ 2. Which of the following statements about driving regulations is MOST accurate? (83)

A. Driver/operators are subject to city, but not state, traffic regulations.
B. Driver/operators are subject to federal, but not local, traffic regulations.
C. Driver/operators are subject to all traffic regulations under nonemergency conditions.
D. Driver/operators are exempt from all driving regulations whether emergency or nonemergency conditions.

_____ 3. The most common place for a vehicle collision to occur is: (85)

A. an intersection.
B. a two-lane highway.
C. unattended parking garages.
D. on ramps on major interstates.

_____ 4. Which of the following statements about mechanical failure during travel is MOST accurate? (89)

A. It may be an immediate occurrence and give no warning.
B. Some type of warning will always accompany a mechanical failure.
C. Driver/operators have typically 3-5 minutes notice for mechanical failures.
D. Mechanical failure is so rare that it is not a concern for driver/operators of modern apparatus.

_____ 5. Before the apparatus is put into motion, all riders must be seated within the cab or body and: (90)

A. wearing their seat belts.
B. wearing hearing protection.
C. must have checked in with the accountability officer.
D. must be carrying a hand-held radio and back-up SCBA.

_____ 6. Which of the following statements about a diesel particulate filter (DPF) is MOST accurate? (95)

A. A DPF system is found only on apparatus manufactured before 2000.
B. A DPF allows larger particulates to stream through the exhaust system.
C. A DPF collects particulates from the exhaust stream and burns them more completely.
D. Apparatus equipped with a DPF system emit more black smoke than older diesel engines.

_____ 7. Which of the following is MOST likely a concern for weight transfer when driving an apparatus? (98)

A. Passengers not distributing weight
B. Wind gusts that can cause apparatus to tilt to one side
C. Water tanks improperly baffled and partially filled with liquid
D. Additional materials such as cribbing and shoring materials that add weight

_____ 8. Which of the following can make steering axle weight too light to steer safely? (98)

A. Over-loaded front axles
B. Under-loaded front axles
C. Adequate weight distribution
D. Too little weight on driving axles

_____ 9. When determining a route to take, driver/operators should plot routes that avoid: (99)

A. low overpasses.
B. four-way intersections.
C. cloverleaf interchanges.
D. residential housing areas.

_____ 10. Which of the following areas is likely to become slippery MORE easily? (99)

A. Bridges
B. Parking lots
C. Intersections
D. Major streets

_____ 11. When in an acceleration skid, the driver/operator should: (108)

A. apply brakes intermittently and turn away from the skid.
B. apply brakes as quickly as possible and turn wheels into the skid.
C. slowly push down on the accelerator to allow the vehicle to come out of the skid.
D. not apply brakes, but should ease off accelerator, and straighten out front wheels as vehicle begins to respond.

_____ 12. Which of the following is a hand signal for stopping? (116)

A. Cross both forearms into a large X
B. Hold both arms vertically over the head
C. Hold both arms horizontally out to the side
D. Have hands in a fist, waving in front of the chest

_____ 13. Which of the following is an item tiller operators must be particularly aware of? (117)

A. Undercorrecting
B. Keeping the trailer in a turn
C. Keeping one hand on the wheel and one on the radio
D. Distance of the trailer from the base of the building involved

_____ 14. Which of the following statements about road tests is MOST accurate? (119)

A. Road tests must be simulated for all weather conditions.
B. Road tests can be completed by using a virtual simulation program.
C. All jurisdictions within a particular state must have the same road test.
D. Local jurisdictions may develop a road test route that will traverse any conditions particular to the area.

_____ 15. Which of the following statements about operating on top of apparatus is MOST accurate? (119)

A. Always have a second person present.
B. Wear a minimum of PPE for freedom of movement.
C. Leave all apparatus doors open when working on top.
D. Always kneel or crawl when working on top of apparatus.

_____ 16. Which of the following statements about hydraulic fluids is MOST accurate? (121)

A. Hydraulic fluids are dangerous only when hot.
B. All hydraulic fluids pose little known risk to humans.
C. Some hydraulic fluids are known to be toxic to human tissue.
D. Synthetic hydraulic fluids are much more toxic to human tissue.

Directions: Write a brief answer to the questions below.

17. In most jurisdictions, what should civilian drivers do when they encounter emergency vehicles responding with warning lights activated and audible devices sounding? (100)

18. What are three factors, other than braking distance and reaction distance, that affect the driver/operator's ability to stop the apparatus? (105)

Chapter 16 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Which of the following systems provides power to operate the various components that stabilize the apparatus and operate the aerial device? (546)

A. Cable system
B. Hydraulic system
C. Bed ladder system
D. Water delivery system

_____ 2. Which of the following is a power-operated ladder that allows firefighters to easily ascend and descend from the tip of the ladder and the turntable for fire rescue operations? (552)

A. Aerial ladder
B. Ground ladder
C. Quintuple fire apparatus
D. Telescoping aerial platform

_____ 3. An elevating platform leveling system is required so that the: (556)

A. platform's position is vertical to the ground at all times.
B. platform is more easily accessible for firefighter egress.
C. platform's position is horizontal to the ground at all times.
D. platform is able to support more than one rescuer at a time.

_____ 4. Telescoping or articulating aerial devices whose primary function is to deploy elevated master streams are known as: (560)

A. quints.
B. aerial ladders.
C. water towers.
D. elevated platforms.

_____ 5. On most aerial devices, the third, fourth, and fifth (if present) sections of the aerial device are extended by: (562)

A. stabilizer cylinders.
B. hydraulic cylinders.
C. a system of sliders and rollers.
D. a system of cables and pulleys.

_____ 6. Which of the following is the most common type of pre-piped aerial ladder waterway system? (567)

A. Bed ladder waterway system
B. Detachable ladder pipe system
C. Telescoping waterway system
D. Elevating platform waterway system

_____ 7. NFPA® 1901 requires a ___ communication system in all aerial device apparatus. (573)

A. one-way
B. two-way
C. power line
D. long-range

_____ 8. Fixed breathing air systems allow one or more firefighters operating at the tip of the aerial device to: (573)

A. breathe clean air with full SCBA on.
B. breathe clean air without the need to don SCBA.
C. refill SCBA cylinders without having to dismount.
D. create an additional barrier in high levels of heat.

_____ 9. Which of the following is the MOST likely result of overtaxing generating equipment when operating scene lighting? (576)

A. Poor lighting and possible damage to the power-generating unit or light
B. Negative effect on the breathing air systems located in the aerial device
C. Possible damage to electrical power cords and junction boxes being used
D. Overly bright lights that may have negative effects on rescue workers' vision

_____ 10. Which of the following is a function that crews assigned to aerial apparatus have historically been assigned? (577)

A. Ventilation
B. Water rescue
C. Haz mat response
D. Vehicle extrication

_____ 11. A driver/operator must be able to perform basic inspection of which of the following? (582)

A. Stabilizing systems
B. Portable generators
C. Fixed lighting systems
D. Water delivery systems

Directions: Write a brief answer to the questions below.

12. What are the five features NFPA® 1901 establishes that an apparatus must have in order to qualify as a quint? (560-561)

13. Name three controls that may be located on the control pedestal besides the levers or "joystick" that control elevation, rotation, and extension of the aerial device. (564-565)

14. List four aerial device interlocks that an apparatus may include. (566)

15. List three additional equipment items that NFPA® 1901 requires aerial apparatus to carry that are not included under ground ladder, forcible entry, or ventilation equipment requirements. (580)

Session 5
Outline

Stabilization

A) Explain
   1) The purpose of the system
      a) Widens the apparatus stability to prevent roll-over
      b) Stabilizers widen the range the center of gravity can safely move
   2) Review center of gravity
   3) Principles of load force transfer
   4) Grade
      a) % of Grade
      b) Restrictions on device movements, grade and slope
         (i) Rule of thumb for lateral pitch correction is
            - Less than 3 ½ degrees 100% capability
            - More than 3 ½ degrees 50% load capacity
            - More than 5 degrees is unsafe to operate
   5) Pitch (side to side or lateral)/Slope (front to back or longitudinal)
B) Types of Stabilizers
   1) Straight Jacks
   2) A-Frame
   3) Scissor
   4) Swing down
   5) Box or H-Type
C) How each is powered
   1) Engine speed is controlled by an integrated system of high idle with lever movement or by an independent high idle switch
   2) Stabilizer controls many times are lever valves which move up to 90 degrees
D) Limits of Each Type
E) Stabilizer Danger
   1) Ice/Snow
   2) Storm Drains
   3) Manhole Covers
   4) Sidewalks
   5) Wet or Soft Earth
   6) Cobblestones on Hills
   7) Short Jacking
F) Process Of Stabilization on Even terrain
   1) Insure Stabilizer Travel Path is clear
   2) Fully Extend stabilizer Horizontally
      a) Place Jack Pads
   3) Extend Stabilizers Vertically
   4) Insure contact with the torque box and weight is taken off of the suspension
      a) An indicator of this is the bulge being taken out of the tires

5) Unless Manufacturer specifies otherwise keep rubber on the road
6) Bring Apparatus as close to level as possible
7) Indicator lights will signal that the interlocks are engaged
    a) Do not trust the lights
8) Visually and manually check all stabilizers
    a) Rack H-type Jacks to insure load capture
9) Pin Jacks
10) Divert Power to the Aerial Device via the Selector valve

G) Process for Un-even terrain
1) Insure Stabilizer Travel Path is clear
2) Fully Extend stabilizer Horizontally
    a) Place Jack Pads
3) Extend the high side stabilizer vertically just to the point that it makes contact with the ground
    a) Checking for interlock activation
4) Extent the low side Stabilizer all the way or until level
5) Return to the high side to make final adjustments
6) Pin Jacks
7) Divert power to the Aerial Device via the Selector valve
8) Lateral grade changes or (slope) are the easiest to overcome
9) On Old Roads high crowns can in some instances prevent Stabilizer Interlock
    a) Position Apparatus Kitty-Corner to correct for grade change
10) For Longitudinal corrections again position Kitty-Corner
    a) Devices compensate more side-to-side than front-to-back

H) Nesting stabilizers
1) Reverse the process for stabilizer deployment
2) When weight is taken off of the stabilizers the apparatus can drop quickly

I) Manual Stabilizers
1) Fold out and screw down manually until they contact the jack pad
    a) Once device is in operation do not adjust

J) Tiller Stabilization
1) All of the same rules apply as with single chassis devices
2) Cab 60' out
    a) Counter weight
3) New devices have interlocks to keep cab inline

Case Study Summary

Date: June 15, 2009

Department: Windsor Locks Fire Department

Location: Windsor Locks Ct.

NIOSH Report Number: N/A

Apparatus used during incident:

1990 Duplex/Baker 95' Aerialscope

Activities being performed at time of Incident:

Offensive Firefighting operations

Incident details:

While operating at a structural fire in a two and a half story wood frame building, Tower 1 was operating over the roof supporting ventilation operations at the time. The inboard outrigger was set-up on the grass just inside the curb. With the device at near full extension and at such a low angle the weight of the device was too much for the ground to hold and the outrigger sank bringing the bucket to rest against the top edge of the second floor of the house. The boom captured the weight of the apparatus and the apparatus did not fully rollover. No one was injured in this accident. A crane was brought in to right the apparatus and the device then had to be fully inspected before going back into service.

Corrective actions:

Chapter 18 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Which of the following is the BEST reason deploying the aerial device without first setting apparatus stabilizers is undesirable? (642)

A. The inherent flexibility of the suspension and tires provides poor stability.
B. More power is needed to lift the aerial device without solid stabilization.
C. The tires can be easily damaged by excessive pressure from the aerial device.
D. More strain is put on surrounding terrain, increasing the chances of it becoming unstable.

_____ 2. When rotating the device 360 degrees, as long as the ___ does not extend outside the base of stability, the apparatus should remain stable. (642)

A. aerial device
B. gravity circle
C. box stabilizer
D. jackknifed trailer

_____ 3. Which of the following must be engaged in order to deploy the stabilizers and the aerial device? (644)

A. The fire pump
B. The pneumatic system
C. The manual stabilizers
D. The aerial hydraulic system

_____ 4. Once the area in which the apparatus is parked is determined to be safe and appropriate for stabilization, the driver/operator should engage: (644-645)

A. the fire pump.
B. the PTO system.
C. manual stabilizers.
D. jackknifing techniques.

_____ 5. Which of the following BEST describes why one stabilizer should never be fully activated alone? (656)

A. It could cause the hydraulic system to shut off.
B. It wastes too much time at an emergency scene.
C. It wastes fuel to activate only one stabilizer at a time.
D. It could cause potential damage to the chassis and torque box.

_____ 6. After stabilizing the aerial apparatus on even terrain the driver/operator should be sure that all stabilizers are: (657)

A. raised exactly the same height regardless of terrain.
B. in firm contact with the ground and bearing weight.
C. positioned on top of sand or other friction enhancing products.
D. positioned with uphill stabilizers higher than downhill stabilizers.

_____ 7. Which of the following types of unevenness is easier to correct when stabilizing the aerial apparatus on uneven terrain? (658)

A. Lateral
B. Parallel
C. Diagonal
D. Longitudinal

_____ 8. Whenever possible, the driver/operator should avoid placing stabilizers on curbs, sidewalks, parking lots, water valve covers, or other similar obstructions because: (661)

A. these surfaces may not support the weight of the stabilizers and could collapse.
B. it takes more power to deploy stabilizers on top of these types of surfaces.
C. it takes too much time to deploy stabilizers on top of these types of surfaces.
D. a spotter is required to position on these surfaces and one is not always available.

_____ 9. Which of the following is the BEST way driver/operators can prevent the aerial device from moving or chattering along a frozen solid surface on an angle? (661)

A. Using wheel chocks
B. Deploying manual stabilizers
C. Positioning the apparatus laterally
D. Positioning the apparatus longitudinally

_____ 10. After fully deploying the stabilizers, the driver/operator must ensure they: (662)

A. are locked and will stay in place.
B. are each raised to exactly the same height.
C. are positioned on top of sand or other friction enhancing products.
D. are no longer using hydraulic power that the aerial device needs.

_____ 11. Which of the following should the driver/operator check before retracting the stabilizers of an aerial apparatus? (663)

A. If all personnel and equipment are clear of the apparatus
B. If all stabilizers have remained on top of the stabilizer pads
C. If the PTO engagement light is on before leaving the cab
D. If any of the tires have sustained damage during the operation

_____ 12. Which of the following types of aerial apparatus are MOST likely to be equipped with manual stabilizers? (664)

A. Older midship and tractor-drawn aerials
B. Modern midship and tractor-drawn aerials
C. Older water towers and elevating platform aerials
D. Modern aerial ladders and elevating platform aerials

_____ 13. Parking tractor-drawn aerial apparatus with an angle between the tractor and trailer sections can: (665)

A. reduce stress on the tires of the apparatus.
B. provide additional stability to the apparatus.
C. shorten the extension needed from the aerial device.
D. reduce the amount of space needed for the apparatus.

Directions: Write a brief answer to the questions below.

14. Name two potential obstructions the driver/operator needs to be observant of when anticipating the expected travel path of stabilizers as they deploy. (652)

15. List two objects the driver/operator should move to ensure the stabilizer shoe contact areas are as stable as possible. (652)

Session 6
Outline

Aerial Movements

A) Basic order of movements for Aerial Devices (one movement at a time ideally)
   1) Raise
   2) Rotate
   3) Extend
   4) Lower
B) Raise the device from the cradle and elevate to just above the required angle of operation
C) Rotate the device around to line up with the selected objective
   1) Rotating the device while it is retracted keeps the lateral stresses on the Aerial to a minimum
D) Extend device to the length needed to reach the objective
E) Lower the device in to the final position of operation
   1) Most devices are not meant to rest against their target
      a) They are designed to operate unsupported as cantilevers
F) We always lower to victims in need of rescue
   1) To civilians in trouble ladders appear as life rafts, and they will jump
   2) The exception to this is if firefighters are in trouble
G) If small adjustments need to be made conduct these operations on low idle and/or feather the Aerial controls
H) Controls should be operated smoothly and in a controlled manner
   1) Most modern controls are linked to the engine idle
I) On older devices engaging the ladder locks will add strength and rigidity to the Aerial device
J) Bedding the device requires the D/O to reverse the operations taken to place the Aerial into operation
   1) Insure the device is lined-up with the cradle and power the device down slowly
   2) Indicator lights, markers or sensors will indicate the device is fully nested
K) When coming off of a roof or any time the device may have come to rest on part of the objective always Raise first then retract
L) Caution needs to be taken during operations of blind tip movement
   1) Use spotters when possible and move the device slowly being conscious of any contact with stationary objects
   2) Use standard hand signals when possible
M) Do not move the device while members are on the Aerial portion of the device
N) Maintain 10' from power lines
O) While operating on a slope or grade
   1) Try to stay in line with the Devices natural bedded position if possible
   2) Try to operate in the uphill quadrant of the devices rotation (check on Exam questions)
P) Operating in Ice conditions ¼" of ice reduces the tip load by half

1) Shrugging can help shed some of the ice
2) Steaming can remove ice that remains

Q) Most devices can operate in winds to between 35-40mph

1) Wind is an example of a dynamic load on the Aerial device
2) Wind Speed estimator in your text pg. 267
   a) Whole trees moving indicates wind speeds of 32-38 mph
3) Follow Manufacturer specification

R) Exposure to high heat (similar to portable ladders)

S) Bedding the Device
1) Reverses the operations taken to place the Aerial into operation
2) Insure the device is lined-up with the cradle and power the device down slowly
3) Indicator lights, markers, sensors and interlocks will indicate the device is fully nested

T) Using EPU

1) If a malfunction occurs while the device is in operation the first action should be to evacuate the device

U) When operating Articulating devices operations need to be adjusted to compensate for the device knuckle

1) Release hold-downs
   a) These hold the device in place during over the road travel
2) Move bucket to the ground for loading
3) Avoid sudden side to side movements of the water stream
   a) This may damage the knuckle

Tip Placement

A) Is dependent on the type of device and task to be accomplished

B) Rescue or Firefighter entry of windows
1) Aerial
   a) Square to window
      (i) If unable to position squarely to the objective insure the inside beam is above the objective and not resting on it
   b) 4"-6" away from wall
   c) Top of hand rails level with the bottom sill of the window (*top rung level with sill for test*)
2) Once civilians are on the ladder portion of any device they need to be escorted down the ladder to the ground
   a) During this time the device cannot be moved
   b) It is preferable to bring civilians to the ground via a platform and fly them directly to the ground without asking them to traverse the device
3) Platform
   a) Door lined up to the window
   b) The mid rail of the bucket level with the windowsill (knee height) for conscious victims

c) For Unconscious victims Top rail of the bucket level with the bottom of the windowsill

C) Rescue or Firefighter entry on Fire escapes and Balconies
   1) Aerial
      a) Next to railing
      b) 4"-6" away (not against)
      c) 3-4 rungs above the railing height
   2) Platforms
      a) Next to the railing
      b) 4"-6" away (not against)
      c) The mid-rail or knee height level with the top rail of the Fire Escape or Balcony
      d) For Unconscious victims Top rail of the bucket level with the top rail of the Fire escape or balcony

D) Roof Access
   1) Aerial
      a) Square to objective
      b) 4"-6" off of roof or parapet edge (not against)
      c) 6' over the roof or parapet edge
   2) Platform
      a) 4"-6" off of the roof or parapet (not against)
      b) The edge of the bucket should be over the roof or parapet edge
   3) If the Aerial device is the primary means of egress for Personnel operating on the roof the device can not be moved with out notifying those members first

E) Ventilation
   1) Position device on the upwind side of the window

F) Technical Rescue
   1) In most situations the Aerial device is used as a high point to anchor to
   2) Aerial Ladders
      a) With standard Aerial devices with no manufacturer anchor points the beams get wrapped from the outside in
      b) Manufacturers will install anchor points on Aerials to meet Department specifications
      c) After market anchor systems can be installed on most Aerial devices
      d) These systems use the strength of the Aerial design to accommodate the rated system load
      e) These systems can also introduce change of direction points which stay in line with the designed load transfer of the device
   3) Platforms
      a) Platforms many times have anchor points built into the devices structure
      b) USAR presumes each person to be 300lbs. for rigging purposes
      c) This means a Medium duty Aerial is overloaded by a standard hauling system
      d) On Platforms that don't have installed anchor points the framework of the platform support system is recommended
   4) Avoid using an Aerial Device for water rescue if at all possible

a) Contact with the water can fail the device

G) Aircraft Operations
   1) *To the wing for Rescue*
      a) *Aerial and Platform treat as you would for going to the roof of a structure*
   2) *Door entry*
      a) *Aerial*
         (i) Tip of the device up to the bottom of the cabin door
      b) *Platform*
         (i) Floor of platform level with the bottom of the door

H) Unique Responses
   1) May challenge the abilities of the D/O
   2) Device operational limitations should be at the forefront in the mind of the D/O
   3) Positioning the apparatus and operating the device in a manner which exposes everyone to the least amount of risk is always preferable

Master Stream Operations

A) Blitz attacks should continue until the fire has darkened down
   1) Requires a high degree of coordination and time

B) Detachable Ladder-Pipe operations
   1) Supply-Line should stay in the middle of the device or evenly distributed
   2) Most times detachable devices flow 500-800 gpms
   3) It is safest to attach the ladder-pipe while the device is still in the bedded position
   4) Observe the 75-80-80 rule

C) Pre-Piped Waterways
   1) Normally flow 1000 gpms
   2) 2" tip should be flowed at 80 psi
   3) Load limits and device limitations need to be observed

D) Friction Loss
   1) Pre-Piped
      a) Pressure needs to be determined as a complete number including; elevation loss, friction loss, Appliance loss and Nozzle Pressure
   2) Detachable Ladder Pipe
      a) Pressure loss can be determined for each component of the System
         (i) Nozzle Pressure
         (ii) Elevation Loss
         (iii) Appliance Loss
         (iv) Friction Loss in the Hose

E) Supplying the Device
   1) Apparatus with a Pump
      a) Treated the same as In-Line pumping
      b) Maintain 20psi on the Compound gauge and use the pump to increase the pressure to what is needed

2) Apparatus with no Pump
    a) Supply Engine should be within 200'
    b) Device needs to be supplied with attack hose
    c) Needed incoming psi should be determined during training

F) If you can not get as close to the building as you would like a smoothbore nozzle is most times the best choice

G) Fog or adjustable nozzles are best for exposure protection

H) Applying water directly to the exposure is the preferred method of exposure protection

I) Zero degree Master Stream operations should only be conducted with deices rated for that type of operation

J) Concluding Master Stream operations

1) Devices should be returned to 70 degrees prior to the water being shut down
2) Devices should be drained prior to bedding the device

Aerial Device Loads

A) Static load is the load of the device and the equipment on it

B) Dynamic load is the load being exerted on it from movement or outside forces

1) A shock load is a type of dynamic load that is sudden

C) Perpendicular load

1) Strongest

D) Lateral load

1) Does the most damage

E) Torsional load

1) Most likely to fail the device
2) Proper rung slope reduces torsional loading of the device

Case Study Summary

Date: January 25, 2009

Department: Kilgore Fire Department

Location: Kilgore TX.

NIOSH Report Number: F2009-06

Apparatus used during incident:

2008 95' Emergency One Ladder Tower

Activities being performed at time of Incident:

Ladder Tower Operations Drill

Incident details:

While training on the operations of a new Ladder Tower four firefighters were in the bucket attempting to land the device on the roof of an eight-story dormitory. As the operator maneuvered over the roof, a "scraping sound" was heard and then a loud "thud". This was an eyelet on the bottom of the platform scraping the edge of the parapet and then the eyelet going over the inside edge of the parapet and the bottom of the platform hitting the top of the parapet. At this time the operator attempted to raise the device away from the parapet but no movement occurred. It was believed by the operator the controls were not responding and more pressure was applied. Witnesses state the ladder was seen bending up away from the building. The eyelet that was hooked over the inside edge of the parapet broke some of the concrete away and the platform violently jerked away from the building. None of the four firefighters were wearing safety belts and the motion of the device threw them all backwards then forwards. As the device and the firefighters came forward, the two firefighters lined up with the bucket doors hit the doors with such force, the doors bent the stops out and both doors opened. This resulted in both firefighters falling eight stories. Firefighters Cory Galloway 28 and Kyle Perkins 45 died as a result of their injuries.

Corrective actions:

Case Study Summary

Date: June 29, 2009

Department: Kingston Fire District

Location: South Kingston RI.

NIOSH Report Number: F2009-18

Apparatus used during incident:

2000 Emergency One 95' rearmount Ladder Tower

Activities being performed at time of Incident:

Firehouse building maintenance

Incident details:

The Platform was being used to retrieve a pike pole, which had dropped onto the top of the overhead door at the rear of the Firehouse. As the bucket was moved into position the operator pinned his head between the top rail of the bucket and the header of the bay door. This situation was noticed within one minute by another firefighter in the Station and he operated the device releasing the operator's head. Firefighter Allan LePage died the next day from the injuries he sustained, he was 67 years old.

Corrective actions:

Case Study Summary

Date: September 29, 2008

Department: David Crocket Steam Fire Company Number 1

Location: Gretna La.

NIOSH Report Number: F2008-33

Apparatus used during incident:

1965 Snorkel 65' articulating boom refurbished and placed on a 1996 Commercial Chassis.

Activities being performed at time of Incident:

Aerial operation during non-emergency activities

Incident details:

While bedding an Articulating Platform from the tailboard control station, the device pinned the head of the operator between the upper boom and an intercom speaker. The upper boom section was not at the recommended angle for safely bedding the device when the accident occurred. The operator was not found for nearly 45 minutes at which time he was freed from the device and attempts to revive the operator failed. Firefighter Ralph Arabie was 48 at the time of his death.

Corrective actions:

Case Study Summary

Date: November 20, 1994

Department: Fire Department of the City of New York

Location: Brooklyn NY.

NIOSH Report Number: N/A

Apparatus used during incident:

1991 Seagrave 100' Rearmount Aerial

Activities being performed at time of Incident:

Victim removal

Incident details:

Ladder Company 108 arrived at a fire in a multiple dwelling with four people trapped in a sixth floor apartment. L-108 extended their ladder 91' out at approx. a 32 degree angle to the window with the occupants. The Outside Vent Man proceeded up the Aerial to the window and took two children ages 6 and 4 from the parents in the apartment. He told them to stay there and he would come back. As soon as he began to descend the ladder with the children, the husband began to assist his wife out the window onto the Aerial, and once she was out he then proceeded out the window onto the tip of the Aerial. With six people on the ladder the device began to sharply deflect. The inside beam was over the edge of the windowsill and this caused the ladder to torsionally load. The device failed sending all six to the pavement below. Firefighter Greg Smith was able to protect both children by cushioning the fall with his own body. Both children Firefighter Smith and the children's mother survived the fall but sustained critical injuries. The father was killed instantly by the fall.

Corrective actions:

Case Study Summary

Date: January 8, 2012

Department: Aliquippa Fire Department

Location: Aliquippa Pa.

NIOSH Report Number: F2012-04

Apparatus used during incident:

1975 American LaFrance 100' Rearmount Aerial

Activities being performed at time of Incident:

Defensive Firefighting Operations

Incident details:

A fire in a two story commercial building was reported and the above Aerial device was first due. Upon arrival the device was positioned 55 feet behind the engine to avoid running over LDH. The Aerial was put into operation as a Ladderpipe. The device was at near full extension and at 32 degrees elevation. A Captain witnessed that the stream was not reaching the seat of the fire and he ascended the ladder to manually operate the ladderpipe. As the Captain arrived at the tip of the device the ladder began to twist to the left and failed. The Captain was hospitalized with non-life threatening injuries.

Corrective actions:

Chapter 19 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Which of the following statements is MOST appropriate regarding safety when riding in the platform of an aerial device? (678)

A. All personnel must have a radio in the platform at all times.
B. All personnel must be in full personal protective equipment at all times.
C. All personnel must be tethered to a structural feature of the platform or an approved anchor at all times.
D. All personnel must have a direct line of sight to the commanding officer on the ground at all times.

_____ 2. Which of the following MUST the operator practice when working from the primary control position? (680)

A. Maintain one-way communication with personnel at the tip or in the platform basket.
B. Be aware of the number, weight, and position of personnel and equipment on the device.
C. Observe personnel on the ground who are helping to extinguish the fire from a defensive stance.
D. Monitor the wind, ice, and waterflow, ensuring that load chart limitations are not exceeded by more than 20.

_____ 3. Which of the following is MOST appropriate before operating a telescoping aerial device? (682)

A. Driver/operator must avoid full-speed operations to ensure feathering.
B. Driver/operator must stabilize the apparatus before conducting operations.
C. Driver/operator must extend the lower arm first before raising the bucket.
D. Driver/operator must turn off the telescoping aerial apparatus to ensure stabilization.

_____ 4. Which of the following is a particular area of concern when operating an articulating aerial device at lower elevations? (685)

A. The knuckle
B. The platform
C. The stabilizers
D. The water pressure

_____ 5. Which of the following is the BEST reason it is always most desirable to use remote controls when operating an aerial ladder with a piped waterway nozzle? (687)

A. It reduces the number of hoselines on the fire ground.
B. It decreases the amount of water needed to combat the fire.
C. It limits the amount of foot traffic by firefighters and the need to freelance on the fire ground.
D. It eliminates the need to place a firefighter in a hazardous position on the tip of the device.

_____ 6. Which of the following devices provides firefighters with a safer standing position when operating the stream? (690)

A. Elevating platforms
B. Aerial ladders with water towers
C. Aerial ladders with piped waterways
D. Aerial ladders with detachable waterways

_____ 7. Which of the following BEST describes operating aerial equipment on a grade under adverse conditions? (692)

A. The aerial device should be parked adjacent to the grade.
B. Aerial devices are designed to routinely handle operating on a grade.
C. The driver/operator must never operate in adverse conditions that may be working against them.
D. The driver/operator must be conscious of conditions and knowledgeable of the limitations of the aerial device.

_____ 8. Which of the following is effective in preventing immediate adhesion to the aerial device when ice formation begins? (693)

A. Applying high-pressure steam
B. Applying a liquid thawing agent
C. Applying distilled water to surfaces
D. Applying grease to exposed sliding surfaces

_____ 9. Which of the following can be used to protect an apparatus that is operated near a fire? (696)

A. Water curtain
B. Ice shrugging
C. Large fire blanket
D. Dry chemical extinguisher

_____ 10. Which of the following should occur if the apparatus displays any signs of mechanical trouble? (696)

A. Continue operating the device
B. Immediately take it out of service
C. Ignore signs until conditions worsen
D. Notify the Commander after the incident

_____ 11. If a device has a mechanical or power failure, who should repair and thoroughly test the apparatus before placing it back in service? (697)

A. A local automobile mechanic
B. An Emergency Vehicle Technician
C. A firefighter with automobile skills
D. The senior driver/operator in the department

_____ 12. Which of the following aerial devices is well-suited for below grade rescue operations? (698)

A. A telescoping aerial device
B. A telescoping elevating platform
C. A two-boom, articulating aerial platform
D. A three-boom, articulating aerial platform

_____ 13. Where can a driver/operator find information regarding precautionary measures and recommendations for safely operating an aerial apparatus? (698)

A. NFPA® 1901
B. Online forums
C. Operator's handbook
D. Warning stickers posted in the cab

Directions: Write a brief answer to the questions below.

14. List four signs of mechanical trouble that the driver/operator must be continually on the lookout for. (696)

15. List four general operating safety tenets for aerial devices. (700-701)

Session 7
Outline

Positioning

A) When approaching the fire building stop short and determine the use of the device
   1) RECEO is what we follow in determining were to position our apparatus
B) Three operational factors determine apparatus use
   1) Rescue is always our first priority and immediately determining if the device is needed for rescue is our first decision for apparatus placement
      a) Offensive mode of operation
      b) Aerials and Sutphens
         (i) Line turntable up with our objective
            - *Tiller devices should be positioned with the cab canted 60 degrees from center away from the objective*
      c) Platforms
         (i) From the bedded position line the bucket up with the objective
            - *This facilitates the doors lining up with the objectives better*
      d) Quints need to be positioned as Aerials then operated as needed as an Engine
   2) Exposure protection
      a) Defensive mode of operation
      b) Position outside the collapse zone 1 ½ times the height of the building
         (i) Use the reach of the Master Stream to allow the device to be positioned further away
      c) Position at the corner of the building if possible
      d) Position to protect the most severely threatened exposure first
   3) If no life hazards or exposure concerns need to be addressed the device is then positioned to support fire suppression operations
      a) Offensive mode of operation
      b) Position for roof access to facilitate ventilation
         (i) Support VEIS activities
      c) For maximum scrub area on a building
         (i) Corners are preferred
C) Investigative mode of operation makes up 80% of our operational time
   1) Stop just short of the building
      a) Position at the first position of best general building coverage
         (i) Do not put out stabilizers
D) To determine the final position of the apparatus identify the objective first
   1) Identify obstructions to the device
   2) Select the best vertex (point that the objective can be reached from back on the street)
   3) Then identify street obstructions (man holes, storm drains, other apparatus etc.)

4) Select the final position that puts the turn table at the vertex and keeps the apparatus footprint off all street level obstructions
5) Placing the device at the proper climbing angle helps to achieve maximum stability
6) Canting the Cab out at a 60 degree angle allows for maximized scrub area on Mid-Mount devices

E) Accounting for operations on uneven terrain
1) Positioning the turntable down hill from the objective minimizes the stress on the device
2) Stability can be increased by operating the device in line with the apparatus

F) Position for Technical Rescue
1) Apparatus should be positioned far enough away to not interfere with rescue operations
2) If PTO driven generators are not needed the engine should be shut down to minimize vibration
3) Try to keep device in line with the bedded position when possible
4) Apparatus exhaust also needs to be considered

G) Position for Aircraft Operations
1) Approach all aircraft from the direction that the pilot can see you
2) Avoid blast areas behind aircraft

H) Level 1 Staging

I) Level 2 Staging
1) *Many times the Officer of the first arriving company to the staging area becomes the staging area manager*

J) Position for Highway Operations
1) Position apparatus between members operating and oncoming traffic

K) Position for Haz-Mat Operations
1)

L) Position on railways

M) Position on elevated roadways or parking garages
1) Load capacities should be checked before the device is set up on them

N) Position at Petroleum Storage Facilities
1) Position upwind from the product
2) Position outside of the Dyke walls

O) Position for EMS Operations
1) The apparatus should block the smaller vehicles from the flow of traffic

Case Study Summary

Date: November 13, 2010

Department: Columbia Fire Department

Location: Columbia SC.

NIOSH Report Number: F2010-36

Apparatus used during incident:

2009 Pierce single rear axle Quint
2007 Pierce Engine

Activities being performed at time of Incident:

Brush fire operations on the side of a limited access highway.

Incident details:

While operating a hoseline at a smoldering brush fire in the median of the highway, two firefighters were struck by a vehicle, which passed between the blocking fire apparatus and the guardrails. The vehicle had slowed to approx. 36 mph when it was struck from behind by a second vehicle traveling at approx. 65mph. After the impact the first vehicle passed straight through the fire scene striking two firefighters and coming to a stop 360' after hitting the firefighters. One firefighter was seriously injured but did recover from their injuries the second firefighter died as a result of his injuries. Firefighter Chance Hyatt Zobel was 23 at the time of his death.

Lessons Learned:

Case Study Summary

Date: September 18, 2011

Department: Shelby Fire Department

Location: Shelby IA.

NIOSH Report Number: F2011-23

Apparatus used during incident:

N/A

Activities being performed at time of Incident:

Traffic Control at a car accident on a limited access highway

Incident details:

At the scene of a minor accident in the median of the highway a firefighter parked the blocking vehicle and set up an orange emergency scene sign and began directing traffic on the traffic side of the control devices. A vehicle traveling in the left lane did not see the traffic slowing down for the accident and swerved towards the median to avoid rear-ending the slower moving vehicles. As the vehicle swerved towards the median it struck Firefighter Michael Collins. Firefighter Collins was pronounced dead at the scene and was 41 at the time of the accident.

Corrective actions:

Case Study Summary

Date: November 24, 2012

Department: Westminster Fire Department

Location: Leominster Ma.

NIOSH Report Number: N/A

Apparatus used during incident:

2005 KME 95' Ladder Tower

Activities being performed at time of Incident:

Defensive Firefighting Operations

Incident details:

Westminster's Ladder Tower was set up in the rear of a three-story apartment building fire. While operating the elevated master stream two members were injured when a portion of the rear wall collapsed onto the bucket. The injuries they sustained were non-life threatening.

Corrective actions:

Chapter 17 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Which of the following BEST describes how later-arriving aerial apparatus are positioned at large incidents? (610)

A. According to the incident action plan
B. According to the position closest to the incident
C. According to the position that is easiest to obtain
D. According to the position that is furthest away from incident

_____ 2. Tactical considerations dictate that the proper distance between the objective and the aerial apparatus is the distance that affords the: (612)

A. least stability.
B. longest extension.
C. best climbing angle.
D. most wind resistance.

_____ 3. Positioning an aerial apparatus in a location that provides the utmost efficiency for operating on the fire ground is known as: (613)

A. spacing.
B. spotting.
C. stabilizing.
D. jackknifing.

_____ 4. Which of the following types of surface should an aerial apparatus only be parked on as a last alternative? (614)

A. On grades
B. Soft surfaces
C. In parking lots
D. Stable surfaces

_____ 5. Moderate to high winds may reduce the overall stability of an aerial apparatus the MOST by: (616)

A. forcing the aerial apparatus into a supported position.
B. creating overhead obstructions for the apparatus to avoid.
C. causing the surface the apparatus is on to become unstable.
D. forcing movement for which the apparatus was not designed.

_____ 6. If possible, driver/operators should avoid spotting the apparatus in a position that will require a lot of aerial device maneuvering: (616)

A. near the apparatus.
B. above the apparatus.
C. next to the objective at the fire scene.
D. around ground and overhead obstructions.

_____ 7. The apparatus is the MOST stable when the aerial device is operated in positions: (619)

A. below the level of the vehicle.
B. above the level of the vehicle.
C. directly to the left or right of the vehicle.
D. directly over the front or rear of the vehicle.

_____ 8. Which of the following can be used to prevent later arriving aerial apparatus from being blocked from a better position by earlier arriving engines or rescue vehicles during the staging process? (625)

A. Jackknifing
B. Proper spacing
C. SOPs governing apparatus placement
D. SOPs governing the chain of command at an incident

_____ 9. Which of the following incidents is MOST likely to be encountered by firefighters on a highway response? (625)

A. Falling debris
B. Flooding conditions
C. Downed powerlines
D. Motor vehicle collisions

_____ 10. When responding to a railroad incident, most railroad companies advise that all vehicles be kept at least: (627)

A. 10 ft. (3 m) from the tracks.
B. 15 ft. (4.5 m) from the tracks.
C. 20 ft. (6 m) from the tracks.
D. 25 ft. (7.5 m) from the tracks.

_____ 11. At an emergency medical incident, if possible, the aerial apparatus should be parked off the street to: (628)

A. make room for other emergency vehicles.
B. improve the overall stability of the apparatus.
C. protect smaller vehicles from oncoming traffic.
D. virtually eliminate any hazards associated with traffic.

_____ 12. Aerial apparatus positioning at structural incidents is determined based on concerns such as building height and condition, as well as immediate functions needed from the apparatus such as: (629)

A. rescue.
B. spotting.
C. jackknifing.
D. stabilization.

_____ 13. Aerial apparatus are MOST frequently used to provide elevated ___ at fires involving large storage tanks or fuel/chemical processing facilities. (634)

A. visuals
B. rescues
C. ventilation
D. master streams

Directions: Write a brief answer to the questions below.

14. What are three factors that the driver/operator must consider when determining the final position of the aerial apparatus? (613)

15. What are four conditions that cause stress on the aerial device? (621)

16. List two things that the driver/operator should consider when approaching, positioning, and beginning operations of the aerial apparatus at specific incidents. (623-624)

17. To identify signs of structural collapse, an aerial device is a useful tool to obtain an overhead look at the building. What are two possible indicators that a building may be becoming unstable? (631)

Session 8
Outline

Strategy and Tactics

A) Maximize scrub area
   1) Corners of buildings
   2) Minimum distance from the building
B) Multiple objectives
   1) Operational Flexibility
      a) Position to reach as many victims as possible
   2) Compensate for the inability to get square
C) Roof Access rule
   1) Cant move the device if it is the only way off
D) Compensate for late arriving apparatus
   1) Angle park for ground ladder access
E) Depth perception helpers
   1) Rope
F) Inside outside positions
   1) Five stories or less
   2) Rear mount only
G) Angle mid-mount cab away
H) Platform as a standpipe
I) Power Venting
J) Stopping horizontal fire spread in stores
   1) Position to save the greatest dollar value of stores
K) Corner buildings get opposing corners
L) Review stressing the Aerial device
M) Load Charts
N) Quint positioning
   1) Multiple operators
O) Pre-Planning
   1) Operational versatility

Chapter 20 Quiz

Name: _____ **Date:** _____

Directions: Write the correct letter on the blank before each question.

_____ 1. Which of the following BEST describes effective communication during an incident? (720)

A. Effective communication is best in written form.
B. Effective communication is achieved when ignoring SOPs.
C. Effective communication often contains jargon and code words to make radio traffic efficient.
D. Effective communication allows for more efficient aerial operations throughout an incident.

_____ 2. Which of the following reduces time and energy if equipment is needed in an upper-level of a building? (721)

A. Firefighters hoisting equipment by crane
B. Firefighters carrying equipment by hand
C. Firefighters delivering equipment by aerial device
D. Firefighters delivering equipment by ground ladders

_____ 3. In an ideal situation, where is the BEST position to place an aerial device at a rescue incident? (721)

A. The A side of the building
B. The corner of the building
C. The side with the largest window
D. The side with the most visible fire

_____ 4. Which of the following is the main objective in rescue situations that require an aerial apparatus? (722)

A. Reach the largest number of groups of people
B. Reach as many victims with minimum number of aerial movements
C. Reach people in exposed areas before those that are in the hazard area
D. Reach those with low priority first to increase the number of lives saved

_____ 5. When using an aerial apparatus to assist in ventilation activities, proper placement can: (737)

A. make cutting operations unnecessary.
B. make the ventilation process quicker and safer.
C. increase the amount of weight the apparatus can support.
D. increase the amount of water discharged from the aerial device.

_____ 6. Elevated master streams are MOST commonly used in: (738)

A. rescue operations.
B. offensive operations.
C. defensive operations.
D. body recovery operations.

_____ 7. Which of the following is MOST likely to affect a fire's ability to spread to exposures? (744)

A. Current and recent weather conditions
B. The number of bystanders at an incident
C. The type of ventilation cut performed on a structure
D. The distance between the aerial device and the structure

_____ 8. How should an aerial apparatus be used in an aircraft rescue situation if escape chutes and portable stairs are not feasible? (748)

A. The aerial device can be used to stabilize an aircraft.
B. The aerial device can be used to ventilate the aircraft.
C. The aerial device can be positioned in the aircraft exit opening.
D. The aerial device can be used to provide lighting at the incident.

Directions: Write a brief answer to the questions below.

9. List the three types of communication. (720)

10. List two strategies and tactics that aerial devices can be used for when accessing upper levels. (721)

11. List two indicators of a potential defensive attack. (742)

12. List three conditions that may affect exposure hazards. (744)