

**DRIVER/OPERATOR - AERIAL
NFPA 1002**

The following lesson plans for Apparatus Driver/Operator - Aerial are based on NFPA 1002, Standard for Fire Department Vehicle Driver/Operator Professional, 1993 Edition. These lesson plans contain the same material that is covered in the Career Development Course for Driver/Operator Aerial. The material in these lesson plans follows natural learning simple to complex sequencing practices. Therefore, mastery of the material in the beginning is required before advancing to the latter lesson plans. The sequence of material in these detailed lesson plans is different from the Career Development Course and NFPA 1002 sequence, which were designed to serve other purposes.

It is recommended that you become familiar with NFPA 1002, Standard for Fire Department Vehicle Driver/Operator Professional Qualifications prior to using these lesson plans. The following list identifies all Lesson Plans and the related NFPA 1002 Job Performance Requirements. Note that if some of the numbers appear more than once; this is because several of the Job Performance Requirements or their prerequisites have to be broken in parts and taught at different times. Finally, if only the Job Performance Requirement number is identified, then all the prerequisite knowledge and skills are covered in that lesson.

Lesson Plan 1

2-2.1
2-2.2

Lesson Plan 2

2-3.1	2-3.3.2
2-3.1.1	2-3.4
2-3.1.2	2-3.5
2-3.2.1	2-3.6
2-3.2.2	2-3.6.1
2-3.3	2-3.8
2-3.3.1	

Lesson Plan 3

4-2.1	4-2.3.2
4-2.2	4-2.4
4-2.2.1	4-2.5
4-2.2.2	4-2.5.1
4-2.3	4-2.5.2
4-2.3.1	

DOD FIRE SERVICE CERTIFICATION SYSTEM

LESSON PLAN 1

Personnel Classification: Apparatus/Driver Operator - Aerial

Subject: Preventive Maintenance

NFPA 1002 Objectives

2-2.1

2-2.2

Training Materials/Equipment:

Aerial vehicle, service records used by the agency, including fire apparatus history card

References:

IFSTA, Fire Department Pumping Apparatus, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Fire Stream Practices, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Water Supplies for Fire Protection, 4th Edition, 1988, Fire Protection Publications, Oklahoma State University.

NFPA 1002: Fire Vehicle Operator Professional Qualifications, 1993 National Fire Protection Association, Quincy, Massachusetts

NFPA 1500: Standard on Fire Department Occupational Safety and Health Programs, 1992 National Fire Protection Association, Quincy, Massachusetts

Additional Information:

IFSTA Firefighter Videotape Series - Fire Pump Operation and Maintenance, Fire Protection Publications, Oklahoma State University

Instructor Tasks

- ¥ Review lesson outline to ensure understanding of contents and procedures.
- ¥ Review references for lesson.
- ¥ Use additional references and your knowledge to enrich lesson outline.
- ¥ Select and prepare any additional audio-visual aids that may assist in the presentation of the lesson.
- ¥ Ensure that all equipment needed, including any audio-visual equipment, is available.
- ¥ Review lesson at end of session to ensure student understanding.
- ¥ Ensure that the topics and objectives of the lesson have been adequately covered.

INTRODUCTION AND OBJECTIVES

- I. Greet class
- II. State purpose of the lesson
- III. Establish relation to previous and following lessons
- IV. Review NFPA 1002 objectives for this lesson
- V. Review any additional materials for this lesson

PRESENTATION

LESSON OUTLINE

INSTRUCTOR NOTES

2-2.1. Preventive Maintenance

- A. Routine Tests, Inspections, and Servicing Functions
 1. Approach to an apparatus check

The majority of the information presented here is by automotive system: battery, coolant system, electrical system, etc. However, as Aerial Driver/Operators become more familiar with vehicle, it may be easier and quicker to approach the vehicle location by location: inside the cab, around the body, under the hood, etc.
- B. Battery check procedure
 1. Corrosion
 - a. Check for corrosion around terminals and other areas surrounding the battery
 - b. Wipe these clean to ensure maximum contact between battery and wires
 2. Cell electrolyte level
 - a. Check the water level of the battery and fill, if needed
 - b. The fill point should at least cover plates
 - c. Be sure water is between minimum and maximum fill levels
 3. Specific gravity
 - a. It is the density of the water which tells the driver/operator how charged the battery is
 - b. To check; draw water from battery into a hydrometer

LESSON OUTLINE

INSTRUCTOR NOTES

- c. Read the measurement on the hydrometer which indicates whether the battery is charged enough to operate
 - d. This must be done cell by cell
 - 4. Test for voltage
 - a. Touch the voltmeter to the two terminals of the battery; be sure that the polarity is correct: red on red (positive) and black on black (negative)
 - b. Be sure voltmeter is set to the appropriate scale
 - 5. Charging the battery
 - a. Charge the battery if the hydrometer indicates the battery is low
 - b. Identify polarity of battery to be charged (positive or negative ground)
 - c. Attach red charger cable to positive battery post
 - d. Attach black charger cable to negative battery post
 - e. Connect battery charger to a reliable power source
 - f. Set desired battery charging voltage and charging rate (if so equipped); switches on battery chargers should be in the OFF position when not in use
 - g. Use caution because hydrogen gas is produced during charging
 - g. Reverse procedure to disconnect the battery charger
 - B. Brake system
 - 1. Air brakes
 - a. Pressure test by tapping the brake pedal
 - b. Check low air warning system
 - c. Check air chuck on rear of apparatus
 - 2. Emergency brakes
 - a. Check emergency brakes (hand brakes) for hold

LESSON OUTLINE

INSTRUCTOR NOTES

- C. Coolant system
 - 1. The coolant system protects both engine and pump
 - 2. For safety, be sure coolant is checked when the engine is entirely cool
 - 3. Procedure
 - a. Check the coolant color and level in the radiator and add fluid (if applicable)
 - b. Inspect the hoses for cracks or leaks
 - c. Flush the coolant system and add rust inhibitor (if applicable)
 - d. Check the radiator fan for loose or cracked blades
 - e. Check temperature gage reading with engine running
- D. Electrical system
 - 1. There are numerous electrical connections in an apparatus; damage from moisture or corrosion can render an electrical connection inoperative
 - 2. Lights
 - a. Operate headlight dimmer switch
 - b. Operate clearance, stop, and back up lights
 - c. Operate all compartment lights and switches
 - d. Operate warning lights and switches
 - e. Operate the floodlights and switches
 - 3. All motor-driven equipment should be started and run once a week
 - a. Operate rotating lights
 - b. Operate hose reel rewind
 - c. Operate apparatus controls
 - d. Operate header and defroster fan
 - e. Operate heater and/or air conditioner (if applicable)
 - f. Operate public address system and radio
 - g. Operate horn
 - h. Check audible and usual warning devices

LESSON OUTLINE

INSTRUCTOR NOTES

- E. Fuel system
 - 1. A full tank of fuel; ensures maximum running time
 - 2. Procedure
 - a. Check fuel level, add fuel if needed
 - b. Check fuel pumps and filters periodically
 - c. Check fuel tank cap vent for blockage, clear if necessary
 - d. Drain moisture from fuel/water separator
- F. Hydraulic fluids
 - 1. Be certain the fluid added is compatible with the fluid already in the reservoir; type of fluid needed is often printed on reservoir or check appropriate technical order or manufactures data.
 - 2. Procedure
 - a. Wipe off lid of reservoir before opening to prevent contamination from water or other contaminants
 - b. Amount to be filled is also found in the same place as the type
 - c. Check master cylinder reservoir
 - d. Check power steering fluid reservoir (if applicable)
- G. Lubrication/oil levels
 - 1. General
 - a. Prime objective of good maintenance
 - b. Proper lubrication saves maintenance and repair dollars; reduces out-of-service time
 - c. Oil gives protection against corrosion, foaming, sludging, and carbon accumulation
 - d. To protect oil from contamination, prevent any unnecessary engine starts

LESSON OUTLINE

INSTRUCTOR NOTES

2. Procedure
 - a. Check technical order/manufactures manual for correct viscosity of the oil
 - b. Check engine oil level
 - c. Check exterior of engine for leaks
 - d. Check transmission oil level
 - e. Check exterior of transmission for leaks
 - f. Check all oil lines for leaks, corrosion or damage
 - g. Check differential oil levels
 - h. Check oil pressure with engine running
- H. Tires
 1. Check tires for cuts, breaks, proper inflation, and uneven wear
 2. Check valve stems for corrosion or damage
 3. Inflate tires to proper level as noted on tire
 4. Check lugs for tightness and rims for damage
- I. Steering system
 1. Check steering gear for excessive motion and periodically lubricate steering gear
 2. Check seals on steering gear
 3. Check fluid reservoir, add fluid if needed
 4. Check all lines and hoses for damage
- J. Belts
 1. Check to make sure belts are present
 2. Check belts for wear
 3. Check for proper tension
- K. Tools, appliances, and equipment
 1. General
 - a. Tools, appliances, and equipment refer to those items carried on the fire apparatus but not permanently attached to or a part of the apparatus
 - b. Most removable equipment is common to all fire equipment and should be checked daily

LESSON OUTLINE

INSTRUCTOR NOTES

2. Procedure
 - a. Remove and (if applicable) clean any equipment attached to the apparatus
 - b. Check portable extinguishers by weighing or reading the gauge
 - c. Check hose loads for correct finishes
 - d. Inventory all nozzles and appliances
 - e. Check air pressure in self-contained breathing apparatus and spare bottles
 - f. Examine regulators and face pieces
 - g. Operate hand lights
 - h. Operate power tools
 - i. Operate hand tools
 - j. Check ground ladders
 - k. Check the first-aid kit for complete
 - l. Check all tool mountings
 - m. Check fluid levels of all power tools/equipment
- L. Agent tank level
 1. Check the water level by shining a flashlight onto agent surface
 2. Fill the agent tanks to capacity
 - a. This should be done daily
 - b. At no time should tanks be less than full
 3. Check the inside surface for corrosion and cleanliness
 4. Check the accuracy of agent level gauges compared to actual agent levels in the tank
 - a. If there is a difference between the two, alert appropriate maintenance facility immediately

LESSON OUTLINE

INSTRUCTOR NOTES

- M. Cab and Body
 - 1. Check operation and condition of compartment doors
 - 2. Check weather seals around cab and compartment doors
 - 3. Check windshield washer solvent, add if needed
 - 4. Operate windshield wipers and washers
 - 5. Check mirror adjustment
 - 6. Inspect all glass for breaks or discoloration
 - 7. Check operation of seat adjusting mechanisms
 - 8. Check condition and operation of seat belts
- N. Other components to check while inside cab
 - 1. Check mirrors for cracks and cleanliness
 - 2. Check map case is complete with grid maps and other applicable maps
 - 3. Check seats for tears and adjustability
- O. Water and Foam Piping
 - 1. Check underside of apparatus for leaks
 - 2. Check drain valves
 - 3. Check oil level for priming pump
- P. Other components to check on the body of the apparatus
 - 1. General
 - a. Fire apparatus must be kept clean
 - b. A clean apparatus engine permits proper inspection and ensures efficient operation as needed
 - 2. Procedure
 - a. Check the body for cleanliness and wash away any visible dirt
 - b. Check for oil, moisture, dirt, and grime
 - c. Check body panels for rust, dents, or exposed areas needing touch-up paint
 - d. Check weather seals around cab and compartment doors for looseness, damage, and deterioration
 - e. Inspect windows for cracks and discoloration

LESSON OUTLINE

INSTRUCTOR NOTES

- 2-2.2 Document routine tests, inspections, and service functions
 - A. Fire apparatus record
 - 1. Maintain as required
 - B. Fire apparatus data and history
 - 1. Maintain as required
 - C. Gasoline, oil and mileage record
 - 1. Maintain as required
 - D. Apparatus inspection report
 - 1. Complete as required
 - a. Daily
 - b. Weekly
 - c. Periodic
 - E. Fire equipment record
 - 1. Complete as required
 - a. Daily
 - b. Weekly
 - c. Periodic

REVIEW

- I. Discuss key lesson points.
- II. Ask questions on the material covered.
- III. Review material that may be unclear.
- IV. Administer test or quiz.
- V. Critique test or quiz.

SUMMARY

- I. Summarize what has been covered.
- II. Relate what has been covered to the next lesson.

DOD FIRE SERVICE CERTIFICATION SYSTEM

LESSON PLAN 2

Personnel Classification: Apparatus Driver/Operator - Aerial

Subject: Driving Operating

NFPA 1002 Objectives

2-3.1	2-3.3.2
2-3.1.1	2-3.4
2-3.1.2	2-3.5
2-3.2.1	2-3.6
2-3.2.2	2-3.6.1
2-3.3	2-3.8
2-3.3.1	

Training Materials/Equipment:

Fully equipped and operational ARFF vehicle, chalkboard, hydrometer, voltmeter, traffic cones, 50 foot tape measure

References:

IFSTA, Fire Department Pumping Apparatus, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Fire Stream Practices, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Water Supplies for Fire Protection, 4th Edition, 1988, Fire Protection Publications, Oklahoma State University.

NFPA 1002: Fire Vehicle Operator Professional Qualifications, 1993 National Fire Protection Association, Quincy, Massachusetts

NFPA 1500: Standard on Fire Department Occupational Safety and Health Programs, 1992 National Fire Protection Association, Quincy, Massachusetts

Additional Information:

IFSTA Firefighter Videotape Series - Fire Pump Operation and Maintenance, Fire Protection Publications, Oklahoma State University

Additional Information:

Applicable Technical Manuals

IFSTA Pumping Apparatus Series Videotapes, Fire Protection Publications, Oklahoma State University

Instructor Tasks

- ¥ Review lesson outline to ensure understanding of contents and procedures.
- ¥ Review references for lesson.
- ¥ Use additional references and your knowledge to enrich lesson outline.
- ¥ Select and prepare any additional audio-visual aids that may assist in the presentation of the lesson.
- ¥ Ensure that all equipment needed, including any audio-visual equipment, is available.
- ¥ Review lesson at end of session to ensure student understanding.
- ¥ Ensure that the topics and objectives of the lesson have been adequately covered

INTRODUCTION AND OBJECTIVES

- I. Greet class
- II. State purpose of the lesson
- III. Establish relation to previous and following lessons
- IV. Review NFPA 1002 objectives for this lesson
- V. Review any additional materials for this lesson

PRESENTATION

LESSON OUTLINE

INSTRUCTOR NOTES

- 2-3.1 Operate fire department vehicle
 - A. Operate a fire department vehicle over a predetermined route
 1. Predetermined route
 - a. Incorporate
 - 1) Maneuvers
 - 2) Features
 2. Vehicle must be operated in compliance with
 - a. Federal laws
 - b. State laws
 - c. Local laws
 - d. Department rules and regulations
 - e. Requirements of NFPA 1500
 3. Predetermined route must include
 - a. 4 left and 4 right turns
 - 1) Approach point of turn
 - 2) Activate turn signal
 - 3) Insure path is clear of traffic or obstructions
 - 4) Check rearview mirrors
 - 5) Slow vehicle
 - 6) Apply brakes, if necessary
 - 7) Make smooth turn to new path of travel

LESSON OUTLINE

INSTRUCTOR NOTES

- b. Straight section of urban business street
 - 1) Drive at posted speed limit or
 - 2) Drive based on conditions
 - 3) Stay in correct lane
 - 4) Move eyes to check
 - a) ahead
 - b) side streets and roads
 - c) other traffic
 - d) rear view mirrors
 - e) observe all traffic laws
- c. 2 lane rural road
 - 1) Drive at posted speed limit or
 - 2) Drive based on conditions
 - 3) Stay in correct lane
 - 4) Move eyes to check
 - a) ahead
 - b) side streets and roads
 - c) other traffic
 - d) rear view mirrors
 - e) observe all traffic laws
- d. Intersections
 - 1) One through
 - a) Approach with vehicle under control
 - b) Observe cross streets/roads
 - c) Slow apparatus
 - d) Be prepared for controlled stop
 - e) Yield to traffic on the right
 - f) Proceed through intersection when safe to do so

LESSON OUTLINE

INSTRUCTOR NOTES

- 2) 2 intersections where stop is required
 - a) Approach with vehicle under control
 - b) Observe cross streets/roads
 - c) Slow apparatus
 - d) Bring apparatus to smooth stop
 - e) Yield to traffic that has right of way
 - f) Proceed through intersection when safe to do so
- e. Railroad crossing
 - 1) Approach crossing with vehicle under control
 - 2) Bring apparatus to complete stop
 - 3) Look in both directions
 - 4) Cross tracks when safe to do so
- f. Curve -right or left
 - 1) Approach curve at safe speed with apparatus under control
 - 2) Slow apparatus, if necessary
 - 3) Stay in proper lane
 - 4) Maintain control of apparatus through curve
 - 5) Accelerate out of curve
- g. Section of limited access highway
 - 1) Conventional ramp entrance
 - a) Approach ramp at safe speed
 - b) Activate turn signal
 - c) Maintain safe ramp speed
 - d) Check left rearview mirror prior to merge
 - e) Adjust speed to merge safely with traffic in acceleration lane

LESSON OUTLINE

INSTRUCTOR NOTES

- 2) Conventional ramp exit
 - a) Activate turn signal
 - b) Check right side rearview mirror
 - c) Steer into deceleration lane
 - d) Slow apparatus
 - e) Maintain control on exit ramp
- 3) Long stretch to allow lane changes
 - a) Activate turn signal
 - b) Check rearview mirror to make sure lane is clear
 - c) Gradually change lanes when safe to do so
- h. Downgrade that requires down shifting and braking
 - 1) Maintain safe speed on approach to downgrade
 - 2) Apply brakes to slow apparatus, if necessary
 - 3) Shift to next lower gear, if applicable
 - 4) Use grade retarder, if applicable
 - 5) Observe engine tachometer to prevent engine overspeeding
 - 6) Use brakes and shift to lower gear, if necessary
 - 7) Maintain control of apparatus
- i. Upgrade that requires shifting to maintain speed
 - 1) Maintain safe speed on approach to upgrade
 - 2) Accelerate when starting up hill
 - 3) Shift to next lower gear when speed slows, or engine rpms fall
 - 4) Change gears to maintain proper rpm
 - 5) Remain in proper lane

engine

LESSON OUTLINE

INSTRUCTOR NOTES

- j. Underpass or low clearance or bridge
 - 1) Approach underpass or bridge slowly
 - 2) Insure that clearance is adequate for apparatus
 - 3) Stop apparatus and check height, if not sure
 - 4) Spotter should be used
- 1.
- C. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, Section 4-2
(Review NFPA 1500, Section 4-2)
 - 4-2.2
 - 4-2.3
 - 4-2.4
 - 4-2.5
 - 4-2.6
 - 4-2.7
 - 4-2.8
 - 4-2.9
 - 4-2.10

LESSON OUTLINE

INSTRUCTOR NOTES

2-3.1.1 Prerequisite Knowledge

- A. Effect on vehicle control
 - 1. Braking reaction time
 - a. Speed directly affects time required to stop
 - b. Driver should know stopping distances for specific apparatus
 - 1) Total stopping distance
 - a) Sum of driver/operator reaction distance and vehicle braking distance
 - b) Reaction distance: distance traveled while driver transfers foot from accelerator to brake pedal after perceiving need to stop
 - c) Braking distance: distance vehicle travels from time brakes are applied until it comes to a complete stop
 - 2. Load (weight) factors
 - a. Loads must be considered by all drivers
 - b. Laws of physics
 - 1) When vehicle undergoes change in velocity of direction - transfer takes place relative to change
 - c. Position of load has effect on vehicle
 - 1) The lower the load the easier to control on turns
 - 2) The higher the load the more the greater the potential for skidding or rollover
 - 3) Avoid high speed turns
 - 4) Steer smoothly to avoid abrupt changes
 - 5) Be extremely careful on slopes and hills

LESSON OUTLINE

INSTRUCTOR NOTES

3. General steering reactions
 - A. Be alert to foresee situations in advance in order to prevent rapid steering movements and loss of control
 - B. Adjust speed for conditions to maintain control while maneuvering the vehicle
 - C. Keep both hands on the wheel at all times, except when shifting or using other controls
 - D. Hands should be positioned at ten and two o'clock
4. Speed
 - A. Adjust speed to compensate for conditions
 - 1) Weather
 - 2) Darkness
 - 3) Traffic
 - 4) Area
5. Centrifugal force
 - A. Force which acts or impels an object out from a center of rotation.
 - B. Related factors
 - 1) Speed of travel
 - 2) Radius of curve
 - 3) Road and tire conditions
 - 4) Grade
 - 5) Superelevation (banked, flat, crowned)
- B. Applicable laws and regulations
 1. Identify all applicable laws related to the operation of emergency vehicles
 - a. Local
 - b. State
 - c. Federal
 2. Identify all applicable rules and regulations of the department

LESSON OUTLINE

INSTRUCTOR NOTES

3. General
 - a. Emergency vehicle operators are subject to all traffic regulations unless a specific exemption is made. The exemption(s) would apply to emergency conditions only.
 - b. Legal decisions have held that driver/operators who do not obey state, local, or department regulations can be subject to criminal and civil prosecution if the apparatus is involved in an accident.
 - c. If the driver/operator is negligent and is involved in an accident, both the driver/operator and the department may be held responsible
 - d. Follow all laws regarding direction of travel, direction of turns, and parking unless under emergency conditions
 - e. Regardless of conditions - stop for school buses with flashing lights
 - f. Obey all traffic laws and signals when returning to quarters

LESSON OUTLINE

INSTRUCTOR NOTES

2-3.1.2 Prerequisite Skills

- A. Safe vehicle operation
 - 1. Emergency and non-emergency defensive driving
 - a. Defensive driver
 - 1) Makes allowances for
 - a) Own deficiencies
 - b) Lack of skill and knowledge of others
 - 2) Recognizes there is no control over
 - a) Unpredictable actions of others
 - b) Weather
 - 3) Concedes right-of-way
 - 4) Makes concessions to avoid collisions
 - 5) Looks ahead and watches situations develop
 - b. Defensive driving factors
 - 1) Proper attitude
 - a) Remain calm and drive in a safe manner
 - b) Reckless driving is never acceptable
 - c) Aggressive attitudes are a menace to other vehicles, pedestrians, and other fire fighters on the apparatus
 - 2) Anticipation of other drivers' actions
 - a) Other drivers may panic at sound of siren
 - b) Some ignore warning signals
 - c) Never assume other driver will react in a rational manner
 - d) Always expect the unexpected

LESSON OUTLINE

INSTRUCTOR NOTES

- 3) Focus fixation
 - a) Tendency to steer toward spot where attention is focused
 - b) Don't focus on distractions
 - 4) Visual lead time
 - a) Aim high in steering - get the the big picture
 - b) Allows driver/operator to become more aware of conditions that may require slowing or stopping
2. Safe driving during adverse weather
- a. Slippery road surfaces
 - 1) Increase stopping distances 3-15 times more than normal
 - 2) Try brakes in area free of traffic
 - 3) If apparatus skids - release brakes immediately
 - 4) Adjust speed to road and weather conditions so that apparatus can be stopped and maneuvered safely
 - b. Vehicle skids
 - 1) Caused by:
 - a) Driving too fast
 - b) Failing to appreciate weight shifts
 - c) Failing to anticipate obstacles
 - 2) If apparatus goes into skid
 - a) Release brakes immediately
 - b) Steer in the direction of skid

LESSON OUTLINE

INSTRUCTOR NOTES

- c. Snow and ice
 - 1) Snow tires and chains will
 - a) reduce stopping distance
 - b) Increase grip for starting
 - c) Increase hill climbing ability
 - 2) Still necessary to maintain lower speeds even with chains
 - 3) Pump brakes gently on snow and ice stopping distance
 - d. Fog
 - 1) Visibility is at its worst in fog
 - 2) Drive slowly using low beams
 - 3) Avoid sudden stops by tapping on brake pedal
 - 4) Never assume a clear road except for distance that you can actually see
 - B. Operate passenger restraining devices
 - 1. Fasten seat belts
 - 2. Make sure that all personnel are seated and belted before moving apparatus
- 2-3.2 Use automotive gauges and controls
- A. Monitor gauges while operating the aerial
 - B. All applicable controls will be used during the performance of the driving and operations functions required by this standard
- 2-3.2.1 Prerequisite Knowledge
- A. Identification and operation of automotive gauges and proper operation limits
 - 1. Gauges are required to ensure proper operation of engine and components and to warn of malfunctions when gauges do not show normal operating ranges
 - 2. Necessary when under way and when operating on the fire ground
 - 3. Some gauges are duplicated
 - a. Dashboard
 - b. Pump panel

LESSON OUTLINE

INSTRUCTOR NOTES

4. Speedometer
 - a. Shows vehicle speed
5. Odometer
 - a. Shows miles traveled
6. Tachometer
 - a. Measures engine RPM (revolutions per minute)
 - b. Provides the driver/operator with information on how to operate the vehicle efficiently without harming the engine
 - c. Provides the driver/operator with information on engine operation when pumping
 - d. Provides an indication of safe operating limits of the engine
 - 1) Consult technical manuals for proper operating range
7. Oil pressure gauge
 - a. Measures oil pressure
 - b. Indicates that oil is being supplied to the engine at the proper pressure
 - c. Normal operating pressures are specified in operations and maintenance manuals
 - d. Significant deviations from normal pressures is an indication of a problem
 - e. Consult technical manuals for proper operating range
8. Ammeter
 - a. Measures and shows the amount of current drawn from the battery to operate electrical equipment, or the amount of current being supplied to the battery for charging
 - b. Consult technical manuals for proper operating range

LESSON OUTLINE

INSTRUCTOR NOTES

9. Voltmeter
 - a. Indicates battery conditions - low or high
 - b. Provides a relative indications of battery condition by showing the amount of drop in voltage that is measured when some of the more demanding electrical accessories are used.
 - c. Indicates the top voltage available when the battery is fully charged
 - d. Consult technical manuals for proper operating range
10. Air pressure gauge
 - a. Indicates air pressure available to operate air brakes
 - b. Consult tech manuals for proper operating range
11. Water temperature gauge
 - a. Indicates temperature of engine coolant
 - b. Provides an indication of when the engine is overheating
 - c. Consult technical manuals for proper operating range
12. Fuel gauge
 - a. Indicates the level of fuel in the tank
13. Transmission oil temperature, if applicable
 - a. Shows temperate of transmission oil
 - b. Consult technical manuals for proper operating range

range

LESSON OUTLINE

INSTRUCTOR NOTES

2-3.2.2 Prerequisite Skills

- A. Operate vehicle controls
 - 1. Set parking brake knob to apply brakes
 - 2. Place transmission gear selector in neutral
 - 3. Turn master switch on
 - 4. Turn on ignition switch
 - 5. Engage starter switch
 - 6. After start-up observe engine gauges and warning lights for proper readings
 - 1) Run engine at 800 to 1,000 rpm to obtain proper operating temperatures and gauge readings
 - 7. Turn on all necessary lights, communications equipment, and warning equipment
 - 8. Select proper gear range
 - 9. Move vehicle forward
 - 10. Come to a complete stop
 - 11. Shift into reverse
 - 12. Come to a complete stop
 - 13. Place transmission selector in neutral
 - 14. Apply parking brake
 - 15. Allow engine to idle for at least 2 minutes before shut down
 - a. Immediate shutdown results in engine temperature increase
 - b. May result in damage to head, exhaust manifolds, and turbocharger
 - c. Engine temperature should stabilize before shutdown
 - 16. Reduce engine speed to low idle
 - 17. Shut of all lights and other equipment
 - 18. Turn ignition switch off
 - 19. Place electrical master switch in the off position

LESSON OUTLINE

INSTRUCTOR NOTES

2-3.3 Back a fire department vehicle from a roadway

- A. Into a restricted space on right and left side
 - 1. Measures driver/operators ability to drive past a space and to back the apparatus into the space without having to stop and pull forward
 - 2. Spotter must be used
 - 3. Restricted space 12 ft in width (Unless vehicle is exceptionally wide, variance must requested.)
 - 4. Exercise requires a 90 degree right and left hand turns from roadway
 - 5. Vehicle must be parked
 - a. Without having to stop and pull forward
 - b. Without striking obstructions
 - 6. Steps
 - a. Driver/operator should drive forward and pass the dock on the left
 - b. Stop the apparatus
 - c. Back the apparatus into the dock
 - d. Repeat the steps by driving forward with the dock on the right

2-3.3.1 Prerequisite Knowledge

- A. Vehicle dimensions (see technical manual for specific vehicle)
 - 1. Length - inches
 - 2. Width - inches
 - 3. Wheel base - inches
 - 4. Overall height - inches
- B. Turning characteristics (see technical manual for specific vehicle)
 - 1. Turning circle - feet

2-3.3.2 Perquisite Skills

- A. Use mirrors for backing
 - 1. Make sure all mirrors are adjusted properly
 - 2. Sit straight with both hands on the steering wheel
 - 3. Move head from side to side to check mirrors
 - 4. Make sure that you can see the spotter
 - 5. Back apparatus following the directions of the spotter

LESSON OUTLINE

INSTRUCTOR NOTES

6. If you cannot see the spotter - stop
 7. Check each mirror from time to time while backing, but always look for the spotter.
- 2-3.4 Maneuver a fire department vehicle around obstructions
- A. Measures ability to steer apparatus in close limits without stopping
 - B. Spotter must be used
 - C. On a roadway around obstructions
 - D. On a roadway around obstructions
 - E. Move in forward and reverse
 - F. Maneuver through obstructions without
 1. Stopping to change direction of travel
 2. Striking obstructions
 - G. Steps
 1. Drive apparatus forward in a straight line with the markers on the left
 2. Stop the apparatus just beyond the last marker
 3. Back the apparatus between the markers by passing to the left of marker number 1, to the right of marker number 2 and the left of marker number 3
 4. After clearing marker number 3 stop the apparatus
 5. Drive forward between the markers leaving marker number three on the left, marker number 2 on the right and marker 3 on the left
- 2-3.5 Turn a fire department vehicle 180 degrees within a confined space
- A. Measures driver/operators ability to turn apparatus around in a confined space
 - B. Spotter must be used
 - C. Vehicle must be stopped and backed up to complete turn
 - D. Continuous U-turn is not allowed
 - E. Vehicle must be turned 180 degrees without striking obstructions within an area measuring 50 ft x 100 ft

LESSON OUTLINE

INSTRUCTOR NOTES

- F. Steps
 1. Move apparatus through 12 ft opening in one of the 50 ft legs (Unless vehicle is exceptionally wide, variance must requested.)
 2. Turn the apparatus 180 degrees and return through the same opening
 3. No limitation on the number of times the vehicle may be maneuvered
- 2-3.6 Maneuver fire department vehicle in areas with restricted horizontal and vertical clearances
 - A. Measures driver/operators ability to steer apparatus in a straight line, judge distances from wheel to object, and stop on a finish line.
 - B. Operator accurately judges ability of vehicle to pass through openings
 - C. Operator accurately judges ability of vehicle so that no obstructions are struck
 - D. Steps
 1. Drive forward through the prop without striking anything
 2. Drive in reverse through the prop without striking anything
- 2-3.8 Operate systems and equipment
 - A. Operate in accordance with
 1. Manufacturers instructions and specifications
 2. Department policies and procedures
 3. Technical order
 - B. Systems
 1. Set relief valve
 - a. Pump in operation
 - b. All lines flowing at desired flow rate
 - c. Set relief valve at desired relief pressure
 - d. Check to make sure discharge pressure is maintained

LESSON OUTLINE

INSTRUCTOR NOTES

2. Set pressure governor
 - a. Set governor for desired discharge pressure
 - b. Check to make sure discharge pressure is maintained
 - C. Equipment
 1. Operate each piece of equipment that is carried on the vehicle
- 2-3.6.1 Prerequisite Skills
- A. Judging vehicle clearances
 1. Skill development
 - a. Practice judging distances while driving and maneuvering at slow speeds.
 - b. Stop periodically get out of vehicle and look at actual distances
 - c. Perform maneuvers that will develop skill at judging distance to the:
 - 1) Front
 - 2) Back
 - 3) Height
 - 4) Width/sides
 - d. Use spotter

REVIEW

- I. Discuss key lesson points.
- II. Ask questions on the material covered.
- III. Review material that may be unclear.
- IV. Administer test or quiz.
- V. Critique test or quiz.

SUMMARY

- I. Summarize what has been covered.
- II. Relate what has been covered to the next lesson.

DOD FIRE SERVICE CERTIFICATION SYSTEM

LESSON PLAN 3

Personnel Classification: Apparatus/Driver Operator - Aerial

Subject: Operations

NFPA 1002 Objectives

4-2.1
4-2.2
4-2.2.1
4-2.2.2
4-2.3
4-2.3.1
4-2.3.2
4-2.4
4-2.5
4-2.5.1
4-2.5.2

Training Materials/Equipment:

Fully equipped and operational aerial device, training ground or training area, fully equipped aerial, water supply source

References:

IFSTA, Fire Department Pumping Apparatus, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Fire Stream Practices, 7th Edition, 1989, Fire Protection Publications, Oklahoma State University.

IFSTA, Water Supplies for Fire Protection, 4th Edition, 1988, Fire Protection Publications, Oklahoma State University.

NFPA 1002: Fire Vehicle Operator Professional Qualifications, 1993 National Fire Protection Association, Quincy, Massachusetts

NFPA 1500: Standard on Fire Department Occupational Safety and Health Programs, 1992 National Fire Protection Association, Quincy, Massachusetts

Additional Information:

IFSTA Firefighter Videotape Series - Fire Pump Operation and Maintenance, Fire Protection Publications, Oklahoma State University

Instructor Tasks

- ¥ Review lesson outline to ensure understanding of contents and procedures.
- ¥ Review references for lesson.
- ¥ Use additional references and your knowledge to enrich lesson outline.
- ¥ Ensure that all equipment needed, including any audio-visual equipment, is available.
- ¥ Review lesson at end of session to ensure student understanding.
- ¥ Ensure that the topics and objectives of the lesson have been adequately covered

INTRODUCTION AND OBJECTIVES

- I. Greet class
- II. State purpose of the lesson
- III. Establish relation to previous and following lessons
- IV. Review NFPA 1002 objectives for this lesson
- V. Review any additional materials for this lesson

PRESENTATION

LESSON OUTLINE

INSTRUCTOR NOTES

- | | |
|--|--|
| <p>4-2.1 Maneuver and position aerial apparatus for proper position and safety</p> <p>A. Standard operating procedures</p> <ol style="list-style-type: none">1. Each incident is different<ol style="list-style-type: none">a. Each requires different positioning techniquesb. Fire location and assignment will determine exact location required2. Procedures assist with orderly placement3. May be function of pre-incident planning<ol style="list-style-type: none">a. Determine best location4. Example<ol style="list-style-type: none">a. First arriving aerial<ol style="list-style-type: none">1) Takes position to best advantage in front of buildingb. Second arriving aerial<ol style="list-style-type: none">2) Takes position to best advantage in rear of building <p>B. Tactical considerations</p> <ol style="list-style-type: none">1. Rescue<ol style="list-style-type: none">a. Best approach is upwindb. Best position is at corner of building<ol style="list-style-type: none">1) Gives access to two sides of building | |
|--|--|

LESSON OUTLINE

INSTRUCTOR NOTES

2. Access to upper levels
 - a. Provides access for fire fighters
 - 1) Interior truck work
 - 2) Interior handlines
 - b. Provides means of escape for fire fighters
 - c. Best approach is upwind
 - d. Best position
 - 1) Place for maximum fire fighter safety
 - 2) Place on side of building opposite fire
3. Ventilation
 - a. Proper placement can make safer and quicker
 - b. Place as close to area being ventilated as possible
 - 1) Minimizes travel distance in the event of roof failure
 - c. Place close enough so ladder can extend above roof level at least 6 feet
 - 1) Allows fire fighters to enter and exit safely
 - 2) Allows fire fighters to find ladder from roof
 - d. Horizontal ventilation placement
 - 1) Place tip upwind
 - 2) Slightly higher than opening
 - 3) Protects fire fighter from heat, smoke, and falling glass
4. Suppression (elevated master streams)
 - a. Never use when interior crews are operating in the same area.
 - b. Normally used for defensive operations
 - c. Position to attack fire
 - d. Position to protect apparatus in the event of building collapse

LESSON OUTLINE

INSTRUCTOR NOTES

- C. Safety considerations
 - 1. The following safety factors should be considered when determining apparatus position
 - a. Surface conditions (pavement or soil)
 - b. Weather
 - c. Wind
 - d. Overhead obstructions - electrical
 - e. Angle of aerial device operation
 - f. Location of aerial device operation
 - g. Fire building conditions

4-2.1.1 Prerequisite Knowledge

- A.. Capabilities and limitations
 - 1. Reach
 - a. Based on length and type of aerial device
 - b. Consult technical order/owners manual for specifications on reach
 - 2. Tip load
 - a. Maximum based on design specifications
Consult technical order/owners manual for design tip load
 - b. General
 - 1) Unsupported
 - a) Angle less than 50°
 - b) Ladder will carry 1/4 of supported load
 - c) Consult Technical Order/Owners Manual for specific ladder
 - d) Concentrated load at tip imposes twice the stress on ladder as an evenly distributed load

LESSON OUTLINE

INSTRUCTOR NOTES

3. Angle of inclination
 - a. Initial elevation high enough so that when ladder is rotated and extended, tip of ladder is well above any supporting surface
 - b. Raise ladder to at least 45° angle before operating other controls
 - c. Angle of between 70° to 80° is best for climbing
 - d. Low angle
 - 1) Increases stress load on ladder
 - 2) Reduces vertical reach
 - 3) High angle makes climbing difficult
4. Angle from chassis axis
 - a. When ladder must be extended to maximum, it should be:
 - 1) Extended parallel to apparatus (over front or rear)
 - 2) Gives maximum stability against tipping
 - 3) If unable to extend over front or rear - keep as close to these positions as possible
- B. Effect of topography
 1. When operating on a slope
 - a. Chassis should be facing:
 - 1) Uphill
 - 2) Downhill - preferred
 2. To compensate for excessive grades - spot apparatus down slope from operation
 3. The lower the hoisted angle of the ladder - the less load it will safely carry

LESSON OUTLINE

INSTRUCTOR NOTES

- C. Surface conditions
 - 1. Soft soil
 - a. Avoid if possible
 - b. Use cribbing and jack-plates
 - 1) Use adequate size and strength
 - 2) Place to prevent slipping
 - c. Monitor conditions continually
 - 2. Paved surfaces
 - a. Parking lots and private drives may have thin surface
 - b. Avoid thin skinned areas if possible
 - c. Use cribbing and jack-plates
 - 1) Use adequate size and strength
 - 2) Place to prevent slipping
 - d. Monitor conditions continually
- D. Weather conditions
 - 1. Ice
 - a. Requires sand under wheels and stabilizers
 - b. Monitor ice for melting under stabilizers
 - c. Ice on aerial device reduces capacity
 - 2. Wind
 - a. Moderate to high winds impose dynamic load on aerial device
 - b. May cause aerial device to become unstable
 - c. Wind will magnify other loads
 - d. During winds
 - 1) Raise device to minimum extension
 - 2) Limit loads to minimum

LESSON OUTLINE

INSTRUCTOR NOTES

4-2.2 Stabilize aerial apparatus

A. Stabilize

1. Set brakes
 - a. Set wheel brakes
 - b. Set parking brakes
2. Set axle locks (if applicable)
 - a. Lock tractor axle to frame
3. Place wheel chocks
 - a. Place manually
 - b. Place in front and rear of drive wheels
 - c. Place every time aerial is used
4. Deploy stabilizers
 - a. Anticipate path of stabilizers to make sure it is clear
 - 1) Look for utility poles, fences, signs, automobiles, etc.
 - 2) Position fire fighter to keep people away
 - b. Check surface that stabilizer will rest on
 - c. Remove all objects that footplates will rest on
 - d. Operate selector valve to apply hydraulic power to the stabilizing system
 - e. Move control to stabilization system
 - f. Stabilizing on even terrain
 - 1) Extend parallel arms to maximum distance possible
 - 2) Place footplates under stabilizing jacks
 - 3) Lower stabilizing jacks
 - 4) Lower jacks on one side of vehicle first
 - 5) Lower until slight pressure starts to lift truck and bulge is removed from tires
 - 6) Deploy jacks on the opposite side
 - 7) With both sides deployed - alternate between them
 - 8) Deploy jacks based on technical order or manufacturers requirements

LESSON OUTLINE

INSTRUCTOR NOTES

- g. Stabilizing on uneven terrain - lateral grade
 - 1) Extend parallel arms to maximum distance possible
 - 2) Place footplates under stabilizing jacks
 - 3) Lower stabilizing jacks
 - 4) Lower jacks on high side of vehicle first
 - 5) Lower until slight pressure starts to lift truck and bulge is removed from tires
 - 6) Deploy jacks on the low side until they raise the truck even with the high side
 - 7) Operate aerial device from high side, if possible
 - 8) Deploy jacks based on technical order or manufacturers requirements

- g. Stabilizing on uneven terrain - longitudinal grade
 - 1) Position apparatus in direct line with desired objective of aerial device
 - 1) Extend parallel arms to maximum distance possible
 - 2) Place footplates under stabilizing jacks
 - 3) Lower stabilizing jacks
 - 4) Lower jacks on one side of vehicle first
 - 5) Lower until slight pressure starts to lift truck and bulge is removed from tires
 - 6) Deploy jacks on the opposite side until they apply the same amount of pressure
 - 7) Use the stabilizers to level the apparatus as much as possible
 - 8) Deploy jacks based on technical order or manufacturers requirements

LESSON OUTLINE

INSTRUCTOR NOTES

- C. Lock stabilizers and transfer power to aerial device
 - 1. When stabilizers are in place - lock
 - a. Hydraulic system holding valves and interlock feature of selector valve provides automatic locking capabilities
 - b. Interlock prevents flow of hydraulic fluid from flowing in or out of system
 - c. Use manual locking devices, if so equipped
- D. Make sure apparatus is stable, safe and ready to raise aerial device

4-2.2.1 Prerequisite Knowledge

- A. Function of apparatus hydraulic system
 - 1. System consisting of:
 - a. Hydraulic pump
 - b. Hydraulic reservoir
 - c. Oil filters
 - d. Hoses
 - e. Relief valve
 - f. Selector valve
 - g. Control valves
 - h. Hydraulic cylinders
 - 2. System provides hydraulic oil under pressure
- B. Specifications and requirements for stabilization
 - 1. Check technical order/owners manual for specifications and requirements for stabilization
- C. How surface and ground conditions affect stability
 - 1. See previous section on same topic
- D. How topography affects stability
 - 1. See previous section on same topic

LESSON OUTLINE

INSTRUCTOR NOTES

4-2.2.2 Prerequisite Skills

- A. Engage and disengage vehicle hydraulic system
 - 1. Engage automatic transmission without fire pump
 - a. Set parking brake
 - b. Place transmission selector in drive gear
 - c. Activate power take off selector switch
 - d. Place transmission selector in neutral
 - e. Check power take off indicator light
 - 2. Disengage automatic transmission without fire pump
 - a. Deactivate power take off control switch while transmission in neutral position
 - 3. Engage manual transmission without fire pump
 - a. Set parking brake
 - b. Place transmission in neutral
 - c. Depress clutch pedal
 - d. Activate power take off selector switch
 - e. Release clutch pedal
 - f. Check power take off indicator light
 - 4. Disengage manual transmission without fire pump
 - a. Return engine to idle
 - b. Depress clutch pedal
 - c. Deactivate power take off control switch
 - d. Release clutch pedal
 - 5. Engage automatic transmission with fire pump in use
Engage power take off and fire pump
 - a. Follow same procedure as automatic transmission without fire pump
 - b. Power take off must be engaged before engaging the fire pump
 - c. Once transmission is in neutral operate pump shift control as directed by pump manufacturer

LESSON OUTLINE

INSTRUCTOR NOTES

6. Disengage power take off and fire pump (automatic transmission)
 - a. Place transmission selector to neutral
 - b. Deactivate pump switch
 - c. Deactivate power take off
 7. Engage manual transmission with fire pump in use
Engage power take off and fire pump
 - a. Follow the same steps as with a manual transmission without a fire pump
 - b. Power take off must be engaged before engaging the fire pump
 - c. With the transmission in neutral operate the pump shift control
 - d. Place main transmission in pump gear
 - e. Release clutch pedal
 8. Disengage power take off and fire pump (manual transmission)
 - a. Depress clutch pedal
 - b. Place transmission in neutral
 - c. Deactivate pump control switch
 - d. Deactivate power take off control switch
- B. Deploy stabilization devices (See: 4-2.2 A)
- 4-2.3 Maneuver and position aerial device
- A. Maneuver and position from each operator position
 1. Raise aerial device
 - a. Release hold-down lock
 - b. Move the control lever on pedestal to "raise" position
 - c. Elevate to approximate operating position
 - d. Operation must be slow and steady
 - e. Return control lever to neutral position

LESSON OUTLINE

INSTRUCTOR NOTES

2. Lowering aerial device
 - a. Use same control
 - b. Operation must be slow and steady
3. Extending aerial device
 - a. Release extension locks
 - b. Move control lever to extend position
 - c. When desired position has been reached - return control to neutral position
 - d. Activate aerial device locks
4. Retracting aerial device
 - a. Release aerial device locks
 - b. Move control to retract position position
 - c. Move control to neutral position
 - d. Engage aerial device locks
5. Rotating
 - a. Release lock - if applicable
 - b. Use control to rotate aerial device
 - c. Rotate to line up intended target
 - d. Operate controls in a slow and steady manner
6. Lowering to objective - roof or window
 - a. Lower device using proper control
 - b. When tip of device is a few inches from designated point - return control to neutral
 - c. Operation must be slow and steady

4-2.3.1 Prerequisite Knowledge

- A. Operation of hydraulic systems
 1. System consists of the following:
 - a. Power take off hydraulic pump
 - 1) Supplies hydraulic oil under pressure to raise, lower, extend, and rotate aerial device
 - b. Hydraulic reservoir
 - 1) Contains a quantity of hydraulic oil that is used in the system

LESSON OUTLINE

INSTRUCTOR NOTES

- c. Hydraulic hose and piping
 - 1) Use to distribute hydraulic oil under pressure from the power take off pump to the hydraulic cylinders, motors, and returns oil to the reservoir
- d. Hydraulic devices
 - 1) Consists of cylinders, motors used to raise, extend, and rotate the aerial device
- d. Hydraulic control valves
 - 1) Valves connected to operator controls that provide a means of controlling the flow of hydraulic oil under pressure to the hydraulic devices.
- B. Purpose and function of hydraulic pressure relief systems
 - 1. Limits pressure that builds in the system
 - 2. Designed to prevent damage due to over-pressurization
- C. Purpose, function, and operation of all aerial device controls
 - 1. Selector valve
 - a. Three way valve that directs oil to:
 - 1) Stabilizer control valves or
 - 2) Aerial device control valves
 - 2. Actuator valves, monitor valves, stack valves
 - a. Supply oil to actuators such as cylinders, and motors
 - b. Actuates stabilizers, aerial device rotation, aerial device elevation, aerial device extension
- D. Purpose and function of all aerial device gauges
 - 1. Pressure gauges normally show the hydraulic oil pressure.
 - 2. Check technical order/owners manual for specific pressure gauge function

LESSON OUTLINE

INSTRUCTOR NOTES

- E. Purpose and function of cable systems, if applicable
 1. Cable systems are used to extend and retract aerial ladders on some ladders
 2. Check aerial ladder to determine if cable system is present
- F. Communications systems
 1. Provides hands free communication between the tip of the ladder or platform and the turntable.
 2. Designed to provide continuous communication between fire fighters and the driver/operator
- G. Purpose and function of electrical systems
 1. May be two systems
 - a. Vehicle electrical system
 - 1) Supplies electricity to operate the vehicle
 - 2) Consists of:
 - a) Batteries
 - b) Generator
 - c) Wiring
 - d) Electrical devices
 - b. System supplied by generator
 - 1) Supplies electricity to operate lights and tools carried on the apparatus
 - 2) Normally mounted on the apparatus
 - 3) Consists of:
 - a) Gasoline, diesel, or hydraulic powered generator
 - b) Wiring
 - c) Safety controls, switches, etc.
 - d) Lights and electrically powered tools

LESSON OUTLINE

INSTRUCTOR NOTES

- H. Operation of emergency systems
 1. All aerial devices are required to have emergency systems
 2. Purpose is to operate aerial device in the event of a failure of the main hydraulic pump
 3. Usually consists of an auxiliary hydraulic pump
 4. Normally a 12 volt pump supplied by the vehicles battery
 5. Can be used to operate the main functions of the aerial device in an emergency
 6. May not be used for prolonged periods of time
 7. Emergency devices and procedures vary between manufacturers
 8. Check technical order/owners manual for specific information
- I. Operation of locking systems
 1. Hold down locks
 - a. Holds aerial device in bed during transport
 - b. Must be released before raising device
 2. Hoisting cylinder locks
 - a. Used to lock cylinders when proper elevation is reached
 3. Rotational locks
 - a. Used to lock the rotation of the turntable
 4. Extension fly locks
 - a. Locks the fly ladder in position when desired extension has been reached
 - b. Locks must be engaged before personnel are allowed on the ladder
- J. Operation of manual rotation system
 1. Some devices are equipped with hand cranks that can be used to rotate the turntable in the event of a hydraulic failure

LESSON OUTLINE

INSTRUCTOR NOTES

- K. Operation of manual lowering system
 - 1. Consult technical order/owners manual for specific system
- L. Operation of stabilizing systems
 - 1. See
- M. Operation of safety systems
 - 1. Consult technical order/owners manual for specific system
- N. Purpose and function of overrides
 - 1. Consult technical order/owners manual for specific system
- O. Limitations of the aerial device
 - 1. Consult technical order/owners manual for specific system
- P. Safety Procedures for aerial ladders
 - 1. General recommendations
 - 2. Consult technical order/owners manual for specific system
 - 3. All ladders are stronger when the load is applied perpendicular to the rungs than when applied laterally
 - 4. The lower angle of the ladder from horizontal, the less load it will safely carry
 - 5. Shock load, such as a person jumping onto the ladder, imposes stresses several times greater than those involved when the load is normally applied
 - 6. Extend ladder over exact front or rear of apparatus or as close to these positions as possible
 - 7. When placing a ladder - ease it toward objective
 - 8. Do not scrape ladder or device against building
 - 9. Engage ladder locks and close cylinder lock before loading ladder
 - 10. Do not overload ladder

LESSON OUTLINE

INSTRUCTOR NOTES

- Q. Safety Procedures for aerial platforms
1. General recommendations
 2. Consult technical order/owners manual for specific system
 3. Do not exceed rated capacity of platform
 4. The weight of the equipment mounted in the platform must be subtracted from the rated capacity of the platform
 5. Shock load, such as a person jumping onto the ladder, imposes stresses several times greater than those involved when the load is normally applied
 6. Strong winds will affect the load capacity and stability of the device
 7. Do not use device to lift items heavier than platform capacity
- Q. Procedures for operating near electrical hazards
1. Electrical hazards are always present
 2. Exercise caution around all overhead lines
 3. Avoid contact with all overhead lines
 4. Articulating boom operators must monitor:
 - a. Platform
 - b. Boom
- R. Procedures for operating near overhead obstructions
1. Exercise same procedures as those for electrical hazards

LESSON OUTLINE

INSTRUCTOR NOTES

4-2.3.2 Prerequisite Skills

- A. Raise, rotate and extend aerial device to specific location
 - 1. Raise
 - 2. Rotate
 - 3. Extend
- B. Lock and unlock aerial device
 - 1. Lock
 - 2. Unlock
- C. Retract, rotate, and lower aerial device
 - 1. Retract
 - 2. Rotate
 - 3. Lower
- D. Bed aerial device for travel

4-2.4 Lower aerial device - emergency

- A. Lower aerial device using emergency system and procedures
- B. Lower safely
- C. Bed aerial device using emergency system and procedures

4-2.5 Deploy and operate elevated master stream

- A. Produce an effective master stream
- B. Safely guidelines for operating master streams
 - 1. Person operating ladder pipe must be securely fastened to the ladder
 - 2. Never more than one person on the top section of the ladder during a ladder pipe operation
 - 3. Operate the ladder pipe nozzle from the ground, when possible
 - 4. Avoid sudden movement or surge when using the ladder pipe
 - a. Slowly elevate
 - b. Slowly lower
 - c. Gradually increase pressure
 - 5. Never direct a fire stream toward electrical wires
 - 6. Always locate supply hose in the center of the ladder

LESSON OUTLINE

INSTRUCTOR NOTES

7. Make sure turntable movement is smooth and slow
8. Use the 75-80-85 rule of thumb
 - a. 75 degree elevation
 - 80 percent extended length
 - 85 psi nozzle pressure for a 1-1/2 inch tip
9. Older units
 - a. Use ladder pipes perpendicular to the rungs
 - b. Maximum lateral movement of 15 degree to either side
 - c. New models have 180 degree sweep capability
 - d. Do not use 2-1/2 inch handline and nozzle strapped to the ladder as a ladder pipe

4-2.5.1 Prerequisite Knowledge

- A. Nozzle reaction
 1. Backward thrust of master stream - opposite direction of master stream
 2. May cause excessive side twist to an extended aerial ladder
 3. Most ladder pipes should be limited to 15 degree swing in either direction

LESSON OUTLINE

INSTRUCTOR NOTES

B. Range of streams

1. Factors

a. Height

- 1) Bed ladder pipe operation limits height of ladder pipe above ground

b. Range

- 1) Bed section pipe
 - a) Limited to arc of bed section
- 2) Tip
 - a) Limited to manufacturers specifications
 - b) Arc of maximum safe angle
 - c) Arc of maximum horizontal reach
 - d) Arc of maximum extension
 - e) Arc of maximum retraction

C. Weight limitations

See technical order/owners manual for specific limitations

4-2.5.2 Prerequisite Skills

A. Connect hose to master stream device

1. Attach master stream device to tip of ladder
2. For additional security use rope to lash device to ladder
3. Attach hose to master stream device
4. Make sure hose is in the center of the ladder rungs
5. Use hose straps to secure hose to ladder
6. Extend hose to ground and connect to siamese
7. Connect supply hoses to the siamese

LESSON OUTLINE

INSTRUCTOR NOTES

- B. Operate elevated nozzle
 - 1. Manually
 - a. Position fire fighter on tip equipped with master stream device
 - b. Operate aerial device following directions of the fire fighter
 - 2. Remotely
 - a. Operate master stream device using remote controls
 - b. See technical order/owners manual for specific procedures

REVIEW

- I. Discuss key lesson points.
- II. Ask questions on the material covered.
- III. Review material that may be unclear.
- IV. Administer test or quiz.
- V. Critique test or quiz.

SUMMARY

- I. Summarize what has been covered.
- II. Relate what has been covered to the next lesson.