

## Instructional/Task Analysis

**Related Information: What the Student Should Know**

**Application: What the Student Should Be Able to Do**

### Unit 1: Principles of Power Transmission

1. Basic concepts of physics related to power transmission
2. Definitions of the types of power-transmission systems
3. Definition of the term *drive system*
4. Functions of the types of drive systems used in power product equipment
5. Function of a clutch in a drive system
6. Types of drive trains used in power product equipment
7. Characteristics used to classify drive trains
8. Definitions of the types of output configurations used in drive trains
9. Types of equipment drives used in power product equipment
10. Functions of the major components of an equipment drive
11. Descriptions of the types of clutch systems
12. Functions of the major components of a clutch system
13. Devices used to actuate clutches
14. Determine power-transmission characteristics of power product equipment

### Unit 2: Mechanical Drive Systems

1. Types of belts used in mechanical drive systems
2. Types of chains used in mechanical drive systems
3. Types of gears used in mechanical drive systems
4. Descriptions of the types of shafts used in mechanical drive systems
5. Types of mechanical drive trains

# Instructional/Task Analysis

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### Unit 2: Mechanical Drive Systems (continued)

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| 6. Functions of the major components of belt drive trains       | 23. Safety rules for working with mechanical clutch systems                            |
| 7. Principles of operation of belt drive trains                 | 24. Typical service procedures required for mechanical clutch systems                  |
| 8. Functions of the major components of gear drive trains       | 25. Determine mechanical drive-train service specifications and parts requirements     |
| 9. Principles of operation of gear drive trains                 | 26. Determine mechanical equipment-drive service specifications and parts requirements |
| 10. Types of mechanical equipment drives                        | 27. Determine mechanical clutch-system service specifications and parts requirements   |
| 11. Principles of operation of mechanical-PTO equipment drives  | 28. Perform routine maintenance on mechanical drive trains                             |
| 12. Principles of operation of ground-drive equipment drives    | 29. Repair mechanical drive trains   |
| 13. Typical service procedures required for belt drive systems  | 30. Perform routine maintenance on mechanical equipment drives                         |
| 14. Typical service procedures required for chain drive systems | 31. Repair mechanical equipment drives   |
| 15. Typical service procedures required for gear drive systems  | 32. Perform routine maintenance on mechanical clutch systems                           |
| 16. Typical service procedures required for shaft drive systems | 33. Repair mechanical clutch systems   |
| 17. Types of mechanical clutch systems                          |  |
| 18. Principles of operation of belt clutch systems              |  |
| 19. Principles of operation of jaw clutch systems               |  |
| 20. Principles of operation of friction clutch systems          |  |
| 21. Principles of operation of centrifugal clutch systems       |  |
| 22. Principles of operation of multi-disc clutch systems        |  |

### Unit 3: Principles of Fluid Power

1. Basic concepts of physics related to fluid-power transmission
2. Descriptions of the types of fluid-power systems commonly used in power product equipment

## Instructional/Task Analysis

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**Related Information: What the Student Should Know**

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### **Unit 3: Principles of Fluid Power (continued)**

3. Functions of the major components of hydraulic systems
4. Common symbols used on hydraulic diagrams
5. Descriptions of the types of hydraulic fluids used in power product equipment
6. Safety rules for working with hydraulic systems
7. Guidelines for preventing equipment damage when working with hydraulic systems
8. Types of power product equipment that use hydraulic power
9. Applications of hydraulic systems in power product equipment
10. Types of hydraulic pumps
11. Functions of the major components of hydraulic pumps
12. Principles of operation of centrifugal hydraulic pumps
13. Principles of operation of rotary hydraulic pumps
14. Principles of operation of diaphragm hydraulic pumps
15. Principles of operation of piston hydraulic pumps
16. Typical service procedures required for hydraulic systems
17. Specialty tools used to perform hydraulic-system service
18. Functions of the major components of pneumatic systems
19. Common symbols used on pneumatic diagrams
20. Safety rules for working with pneumatic systems

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#### Unit 3: Principles of Fluid Power (continued)

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| 21. Guidelines for preventing equipment damage when working with pneumatic systems | 32. Interpret flow diagrams and assembly drawings |
| 22. Types of power product equipment that use pneumatic power                      | 33. Measure hydraulic-system temperature          |
| 23. Applications of pneumatic systems in power product equipment                   | 34. Measure hydraulic-system pressure             |
| 24. Types of pneumatic pumps   | 35. Measure hydraulic-system flow                 |
| 25. Functions of the major components of pneumatic pumps                           | 36. Measure air pressure                          |
| 26. Principles of operation of centrifugal pneumatic pumps                         | 37. Measure airflow                               |
| 27. Principles of operation of propeller pneumatic pumps                           |   |
| 28. Principles of operation of diaphragm pneumatic pumps                           |   |
| 29. Principles of operation of reciprocating pneumatic pumps                       |   |
| 30. Typical service procedures required for pneumatic systems                      |   |
| 31. Specialty tools used to perform pneumatic-system service                       |   |

#### Unit 4: Hydraulic and Pneumatic Drive Systems

1. Descriptions of the types of clutches used with hydraulic and pneumatic drive systems
2. Descriptions of the types of hydraulic drive trains used in power product equipment
3. Functions of the major components of hydrostatic drive trains
4. Principles of operation of hydrostatic drive trains
5. Principles of operation of axial-piston hydraulic pumps
6. Principles of operation of radial-piston hydraulic pumps

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#### Unit 4: Hydraulic and Pneumatic Drive Systems (continued)

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| 7. Types of hydrostatic drive trains as classified by their pump and motor designs | 14. Determine hydraulic and pneumatic drive-system service specifications and parts requirements |
| 8. Principles of operation of hydraulic equipment drives                           | 15. Perform routine maintenance on hydraulic drive trains  |
| 9. Typical service procedures required for hydraulic drive systems                 | 16. Repair hydraulic drive trains  |
| 10. Types of pneumatic power used to accomplish work in power product equipment    | 17. Perform routine maintenance on hydraulic equipment drives                                    |
| 11. Functions of the major components of pneumatic drive systems                   | 18. Repair hydraulic equipment drives  |
| 12. Principles of operation of pneumatic equipment drives                          | 19. Perform routine maintenance on pneumatic equipment drives                                    |
| 13. Typical service procedures required for pneumatic drive systems                | 20. Repair pneumatic equipment drives  |

#### Unit 5: Wheel and Brake Systems

1. Functions of the major components of tire and wheel assemblies
2. Descriptions of the types of tires used in power product equipment
3. Types of rims used in tire and wheel assemblies
4. Types of wheel supports used in tire and wheel assemblies
5. Typical service procedures required for tire and wheel assemblies
6. Uses of the specialty tools used in tire and wheel service
7. Safety rules for performing tire and wheel service
8. Definitions of the types of brake systems used in power product equipment
9. Functions of the major components of mechanical brake systems
10. Descriptions of the types of mechanical brake systems

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### Unit 5: Wheel and Brake Systems (continued)

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| 11. Principles of operation of mechanical brake systems                      | 20. Determine tire-and-wheel system service specifications and parts requirements |
| 12. Typical service procedures required for mechanical brake systems         | 21. Determine brake-system service specifications and parts requirements          |
| 13. Functions of the major components of hydraulic brake systems             | 22. Service tires and rims  |
| 14. Principles of operation of hydraulic brake systems                       | 23. Service wheel bearings and bushings   |
| 15. Descriptions of types of disc- and drum-brake hydraulic-cylinder designs | 24. Perform routine maintenance on mechanical brakes                              |
| 16. Typical service procedures required for hydraulic brake systems          | 25. Repair mechanical brakes  |
| 17. Safety rules for performing brake-system repair                          | 26. Perform routine maintenance on hydraulic brakes                               |
| 18. Types of parking brakes used in power product equipment                  | 27. Repair hydraulic brakes   |
| 19. Typical service procedures required for parking brakes                   | 28. Perform routine maintenance on parking brakes                                 |
|  | 29. Repair parking brakes   |

### Unit 6: Chassis and Steering Systems

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| 1. Functions of the major components of chassis                            | 8. Determine chassis and steering-system service specifications and parts requirements |
| 2. Typical service procedures required for chassis                         | 9. Repair or replace chassis components  |
| 3. Types of steering systems used in power product equipment               | 10. Perform routine maintenance on mechanical steering systems                         |
| 4. Types of steering-system configurations used in power product equipment | 11. Repair mechanical steering systems   |
| 5. Functions of the major components of steering systems                   | 12. Perform routine maintenance on hydraulic steering systems                          |
| 6. Principles of operation of the types of gears used in steering systems  | 13. Repair hydraulic steering systems  |
| 7. Typical service procedures required for steering systems                | 14. Perform routine maintenance on drive-wheel steering systems                        |
|  | 15. Repair drive-wheel steering systems  |

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### Related Information: What the Student Should Know

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#### Unit 7: Chassis Electrical Systems

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| 1. Definitions of terms associated with electrical systems                             | 15. Interpret chassis-electrical-system schematics                                    |
| 2. Functions of the major components of chassis electrical systems                     | 16. Determine chassis-electrical-system service specifications and parts requirements |
| 3. Functions of the types of safety shutoff devices used in chassis electrical systems | 17. Perform routine maintenance on chassis electrical systems                         |
| 4. Functions of the types of personal-safety shutoff devices                           | 18. Repair chassis electrical systems   |
| 5. Functions of the types of equipment-safety shutoff devices                          | 19. Perform routine maintenance on electrical equipment drives                        |
| 6. Descriptions of the types of lights used in chassis electrical systems              | 20. Repair electrical equipment drives  |
| 7. Typical service procedures required for chassis electrical systems                  | 21. Perform routine maintenance on electromagnetic clutches                           |
| 8. Principles of operation of electric equipment drives                                | 22. Repair electromagnetic clutches   |
| 9. Typical service procedures required for electric equipment drives                   |   |
| 10. Major components of electromagnetic clutches                                       |   |
| 11. Principles of operation of electromagnetic clutches                                |   |
| 12. Typical service procedures required for electromagnetic clutches                   |   |
| 13. Common symbols used on electrical schematics                                       |   |
| 14. Functions of the specialty instruments used in electrical-system repair            |   |