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# Outline Airframe – Part 2, Systems and Components, Curriculum

## Instructional Units, Segments and Estimated Instructional Time

### Aircraft Landing Gear Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-A)

29. Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems  
Ref: 147-C-A29 – 82.0 hrs Level 3
- A. Clean and store tires Level 2
  - B. Inspect, demount, repair and reinstall tires on wheels Level 3
  - C. Remove, inspect, service and reinstall a wheel assembly on an axle Level 3
  - D. Disassemble, identify components and reassemble mechanical and hydraulic type brake assemblies Level 2
  - E. Replace a brake actuating cylinder Level 3
  - F. Adjust clearance on show, multiple disk and single disc brake Level 3
  - G. Inspect, repair and operationally check a master cylinder Level 3
  - H. Inspect, service and describe the operation of power brake and emergency brake systems Level 2
  - I. Recognize probable cause of brake malfunctions Level 2
  - J. Bleed air from hydraulic brake systems Level 3
  - K. Service, repair and troubleshoot landing gear oleo struts Level 2
  - L. Describe the operation of an oleo shock strut Level 2
  - M. Operate, inspect and adjust a retractable landing gear Level 3

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- N. Check landing gear alignment Level 2
- O. Inspect, adjust and service nose and tail wheel steering and damping mechanisms Level 3

Estimated Instructional Time: 82.0 hrs

**Hydraulic and Pneumatic Power Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-B)

- 30. Repair hydraulic and pneumatic power systems components Level 3  
 Ref: 147-C-B30 – 15.0 hrs
  - A. Select and install seals Level 2
  - B. Identify, remove and install a hydraulic selector valve Level 2
  - C. Remove and install pressure regulators Level 2
- 31. Identify and select hydraulic fluids Level 3  
 Ref: 147-C-B31 – 2.0 hrs
  - A. Identify and select hydraulic fluids Level 3
- 32. Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems Level 3  
 Ref: 147-C-B32 – 55.0 hrs
  - A. Solve problems involving force, area and pressure Level 2
  - B. Interpret reference information pertaining to operation of a basic hydraulic system Level 2
  - C. Compare constant pressure and open center types of hydraulic systems Level 2
  - D. Inspect and service hydraulic reservoirs Level 3
  - E. Identify and describe the operation of constant and variable displacement hydraulic pumps Level 2
  - F. Check, inspect, remove and install hydraulic power pumps Level 3

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- G. Troubleshoot hydraulic pumps Level 3
- H. Remove, install, inspect, service and check hydraulic accumulator Level 3
- I. Troubleshoot and determine the cause of low, high or fluctuating system hydraulic pressure Level 3
- J. Inspect, check and service a hydraulically operated flap system Level 2

Estimated Instructional Time: 72.0 hrs

**Cabin Atmosphere Control Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-C)

- 33. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, pressurization systems, and air cycle machines  
Ref: 147-C-C33 – 14.0 hrs Level 1
  - A. The inspection, checking and troubleshooting of aircraft combustion heaters and exhaust type heat exchangers Level 1
  - B. The checking and troubleshooting of aircraft vapor cycle and air cycle cooling systems Level 1
  - C. The functions and principles of operation of aircraft air conditioning Level 1
  - D. The principles of operations and control of cabin pressurizations Level 1
- 34. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, and pressurization systems  
Ref: 147-C-C34 – 9.0 hrs Level 1
  - A. Identify components of an aircraft combustion heater, Freon cooling system, and an air cycle expansion turbine Level 1
  - B. Repair or replacement procedures for air conditioning and pressurization components Level 1

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C. Repair or replacement procedures for aircraft oxygen system components	Level 1
35. Inspect, check, troubleshoot, service, and repair oxygen systems Ref: 147-C-C35 – 7.0 hrs	Level 2
A. Inspect, check and service oxygen systems	Level 2
Estimated Instructional Time:	30.0 hrs

### **Aircraft Instrument Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-D)

36. Inspect, check, service, troubleshoot, and repair electronic flight instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position indicating systems to include the use of built-in test equipment Ref: 147-C-D36 – 9.0 hrs	Level 1
A. Inspect, check, service, troubleshoot and repair instrument systems	Level 1
37. Install instruments and perform a static pressure system leak test Ref: 147-C-D36 – 11.0 hrs	Level 2
A. Handling and storing of instruments	Level 2
B. Install instrument panel and instruments	Level 2
Estimated Instructional Time:	20.0 hrs

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## Communication and Navigation Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-E)

38. Inspect, check, and troubleshoot autopilot, servos, and approach coupling systems  
Ref: 147-C-E38 – 5.0 hrs Level 1
- A. Purpose and operating principles of autopilots and approach control systems Level 1
39. Inspect, check, and service aircraft electronic communication and navigation systems, including VHF passenger address interphones and static discharge devices, aircraft VOR, ILS, LORAN, Radar beacon transponders, flight management computers, and GPWS  
Ref: 147-C-E39 – 5.0 hrs Level 1
- A. Types and installation of aircraft electronic communications and navigation equipment Level 1
- B. FCC regulations pertaining to two-way radio operation Level 1
40. Inspect and repair antenna and electronic equipment installations  
Ref: 147-C-E40 – 10.0 hrs Level 2
- A. Repair and replace aircraft antennas and related electronic equipment Level 2
- B. Identify and describe purpose of static discharges Level 2
- Estimated Instructional Time: 20.0 hrs

## Aircraft Fuel Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-F)

41. Check and service fuel dump systems  
Ref: 147-C-F41 – 1.0 hrs Level 1
- A. Describe the checking and servicing of a fuel dump system Level 1

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42. Perform fuel management transfer and defueling Ref: 147-C-F42 – 2.0 hrs	Level 1
A. Perform fuel transfer and defueling	Level 1
43. Inspect, check, and repair pressure fueling systems Ref: 147-C-F43 – 2.0 hrs	Level 1
A. Describe the inspection, checking and repair of pressure fueling systems	Level 1
44. Repair aircraft fuel system components Ref: 147-C-F44 – 10.0 hrs	Level 2
A. Interpret information pertaining to repair of fuel system components	Level 2
45. Inspect and repair fluid quantity indicating systems Ref: 147-C-F45 – 6.0 hrs	Level 2
A. Inspect and troubleshoot fuel quantity indication systems	Level 2
46. Troubleshoot, service, and repair fluid pressure and temperature warning systems Ref: 147-C-F46 – 2.0 hrs	Level 2
A. Troubleshoot, service, and repair fuel pressure and temperature warning systems	Level 2
47. Inspect, check, service, troubleshoot, and repair aircraft fuel systems Ref: 147-C-F47 – 13.0 hrs	Level 3
A. Inspect and service, fuel tanks	Level 3
B. Inspect, check, service, troubleshoot and repair fuel valves and fuel pumps	Level 3
Estimated Instructional Time:	36.0 hrs

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## Aircraft Electrical Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-G)

48. Repair and inspect aircraft electrical system components, crimp and splice wiring to manufacturers' specifications, and repair pins and sockets of aircraft connectors  
Ref: 147-C-G48 – 24.5 hrs Level 2
- A. Determine causes and effects of switch chatter in solenoid switches and relays Level 2
  - B. Inspect installation and check circuits and anti-collision and positions lights Level 2
  - C. Inspect, check, and repair landing and taxi light installations Level 2
  - D. Inspect, check, service and repair aircraft interior lighting installations Level 2
  - E. Inspect, check, service and repair cockpit lights and lighting circuits Level 2
  - F. Inspect and check electrical equipment installations for integrity of mounting and connections Level 2
  - G. Inspect, check, and repair passenger call system Level 1
  - H. Locate replacement procedures and parts numbers for electrical component replacements Level 2
49. Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices  
Ref: 147-C-G49 – 42.5 hrs Level 3
- A. Types and characteristics of aircraft fuses, circuit breakers and switches Level 1
  - B. Select and install aircraft electrical switches and wiring to components Level 3
  - C. Installation requirements and characteristics for aircraft electrical wiring systems and junction boxes Level 2
  - D. Install electrical terminals, splices and bonding jumpers Level 3
  - E. Install aircraft electrical wiring in a conduit Level 2

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F. Check and connect quick-disconnect plugs and receptacles	Level 2
G. Protect electrical emergency switches against accidental actuation	Level 3
H. Identify and describe characteristics of aircraft high tension and low tension electrical wiring	Level 2
50. (a) Inspect, check, troubleshoot, service, and repair alternating and direct current electrical systems Ref: 147-C-G50 – 36.0 hrs	Level 3
(b) Inspect, check, and troubleshoot constant speed and integrated speed drive generators Ref: 147-C-G50 – 2.0 hrs	Level 1
A. Methods of controlling output current and voltage of compound DC generators	Level 2
B. Check, troubleshoot and repair an aircraft dual DC generator electrical system	Level 3
C. Methods of providing AC in aircraft having only DC electrical systems	Level 1
D. Troubleshoot and repair a DC electrical system supplied by an alternator	Level 3
E. Characteristics and advantages of AC aircraft electrical systems	Level 1
F. Identify components and operating elements of a 208/114 volt AC aircraft electrical system	Level 2
G. Inspect, check and troubleshoot constant speed and integrated speed drive generators	Level 1
 Estimated Instructional Time:	 105.0 hrs

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## Position and Warning Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-H)

51. Inspect, check, and service speed and configuration warning systems, electrical brake controls, and antiskid systems  
Ref: 147-C-H51 – 11 hrs Level 2

A. Principles of operation, inspection and check of speed, stall, takeoff warning systems and antiskid brake control systems Level 1

B. Show simulated operation of antiskid takeoff warning systems Level 2

52. Inspect, check, troubleshoot, and service landing gear position indicating and warning systems  
Ref: 147-C-H52 – 9 hrs Level 3

A. Inspect, check, troubleshoot, service and repair landing gear position indicating and warning systems Level 3

Estimated Instructional Time: 20.0 hrs

## Ice and Rain Control Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-I)

53. Inspect, check, troubleshoot, service and repair airframe ice and rain control system  
Ref: 147-C-I53 – 12 hrs Level 2

A. Principles of installation, operation and checking deicing and anti-icing systems Level 1

B. Replace inspect and check operation of electrically operated air scoop and pitot static or static vent anti-icing Level 2

Estimated Instructional Time: 12.0 hrs

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## Fire Protection Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-J)

54. Inspect, check, service smoke and carbon monoxide detection systems Ref: 147-C-J54 – 1 hrs	Level 1
A. Principles of operation of smoke and carbon monoxide detectors	Level 1
55. Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems Ref: 147-C-J55 – 11 hrs	Level 3
A. Inspect, check, troubleshoot and repair fire detection systems	Level 3
B. Select and operate fire extinguishers	Level 2
C. Check, troubleshoot and repair built-in fire extinguishing systems	Level 2
Estimated Instructional Time:	12.0 hrs
Additional Practice and/or Examinations	5.0 hrs
Grand Total Airframe – Part 2, Systems and Components, Curriculum	414.0 hrs

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# Outline Airframe – Part 2, Systems and Components, Curriculum Detail

## Aircraft Landing Gear Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-A)

29. Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems

(EIT = 82 hrs, T = 32 hrs, L/S = 50 hrs)

Level 3

A. Clean and store tires

Level 2

Student Performance Goal

Given:

Used aircraft tires, approved tire cleaning materials and appropriate written information describing the cleaning and storing of tires.

Performance:

The student will clean an aircraft the, removing oils and other deteriorating materials and describe the procedure to be followed when storing tires and other rubber aircraft products.

Standard:

The cleaning and description of procedure will comply with the reference information without error or omission.

B. Inspect, demount, repair and reinstall tires on wheels Level 3

Student Performance Goal

Given:

Aircraft wheels with tires of both the tube and tubeless types, written procedures for tire servicing. AC 43.13-1 or equivalent publications and appropriate tire servicing tools and equipment.

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Performance:

The student will demount one tubeless tire and one tube type tire from the wheel. He will inspect the tires, tube and wheel assembly, determine the necessary repairs, make one repair to a tube, reinstall the tire and tube and inflate to correct pressures. He will practice and explain the safety precautions related to tire servicing

Standard:

Written procedures will be followed without error. One completed tire installation will conform to return-to-service standards.

- C. Remove, inspect, service and reinstall a wheel assembly on an axle

Level 3

Student Performance Goal

Given:

An aircraft wheel assembly mounted on an airplane or on a mock-up, appropriate written service information and wheel removal tools and equipment.

Performance:

The student will raise the aircraft and re- move the wheel from the axle. He/She will inspect the wheel assembly and bearings and prepare a written list of five discrepancies that are commonly found. He will describe the reasons for rejecting wheel components and describe the repairs that may be accomplished. He will lubricate the bearings of the wheel assembly, reinstall the wheel on the axle, adjust the bearing play, and lower the airplane.

Standard:

Service information and procedure will be followed without error or omission. Correct nomenclature will be used as a part of the descriptions and explanations. The task will be accomplished at a return-to-service standard.

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- D. Disassemble, identify components and reassemble mechanical and hydraulic type brake assemblies Level 2

Student Performance Goal

Given:

Typical shoe type mechanically operated aircraft brakes; samples of hydraulically actuated brakes of the servo, expander-tube, single and multiple disc types: drawings or diagrams of each type of brake, written service information that identifies the components and describes the operation of the system.

Performance:

The student will disassemble, identify the components, describe the operation and reassemble each brake assembly.

Standard:

Brake assemblies need not meet return-to-service standards. Disassembly, inspection and reassembly operations will be in complete accordance with the service Information provided. Correct nomenclature and terminology will be used throughout the descriptions of operations of the systems.

- E. Replace a brake actuating cylinder Level 3

Student Performance Goal

Given:

An operational hydraulic brake system installed in an airplane or mock-up, a spare operational actuating cylinder to replace a wheel cylinder installed in the system, written service Information, appropriate hydraulic fluids and tools.

Performance:

The student will replace an actuating cylinder in the wheel brake assembly; following form a functional test of the system following the replacement of the cylinder.

Standard:

The system will operate normally. There will be no indications of external or Internal leakage.

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- F. Adjust clearance on show, multiple disk and single disc brake Level 3

Student Performance Goal

Given:

A mock-up or training device that incorporates a wheel and brake assembly of a shoe, multiple-disc and single-disc types, replacement lining blocks, written service information or manuals and appropriate tools.

Performance:

The student will remove the wheel from the axle, inspect the brake assembly, adjust the clearance of each brake, as necessary, and reinstall the wheel.

Standard:

The adjusted brake (shoe, multiple and single disc) will comply with the clearance adjustments specified in the service information. The procedures and work accomplished will be of return-to-service standard.

- G. Inspect, repair and operationally check a master cylinder Level 3

Student Performance Goal

Given:

An operational brake master cylinder, written service information and overhaul manuals, required seals, gaskets, fluids and suitable equipment to check the operation of a master cylinder.

Performance:

The student will disassemble a brake master cylinder, inspect the components, replace seals (as required), reassemble and check the operation of the master cylinder.

Standard:

Procedures will be in accordance with the written information. The reassembled cylinder will operate without internal or external leakage.

- H. Inspect, service and describe the operation of power brake and emergency brake systems Level 2

Student Performance Goal

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Given:

An operational power brake system incorporating a power brake control valve, shuttle valve and brake assembly, a brake sub-system, accumulator, an emergency brake power system, deboosters, hydraulic fuse and anti-skid device, a diagram or drawing of the entire system and written information describing the operation and servicing of the system.

Performance:

The student will identify the components of the system and label the diagram or drawing. Using the reference information, he will service and operate the system. He/She will describe the operation of power brake and emergency brake systems.

Standard:

Correct nomenclature and terminology will be used to describe the system operation and to label the diagram. Operation and servicing of the system will be in accordance with the reference information.

- I. Recognize probable cause of brake malfunctions      Level 2

Student Performance Goal

Given:

The airplane manufacturer's service information, ten written statements describing brake fading, excessive pedal travel, grabbing brakes, spongy brake action and dragging and locked brakes.

Performance:

The student will describe the probable cause for each of the malfunctions described in written statements.

Standard:

The student will provide at least one probable cause for each of the malfunctions. Information obtained from the manufacturer's service manual will be interpreted without error.

- J. Bleed air from hydraulic brake systems      Level 3

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Student Performance Goal

Given:

Manufacturer's service instruction, appropriate bleeding equipment, supply of hydraulic fluids, and an operable hydraulic system into which air has been introduced.

Performance:

The student will bleed the system of air.

Standard:

The procedure specified in the service instructions will be followed without error or omission. The system, following bleeding, will be completely operational.

- K. Service, repair and troubleshoot landing gear oleo struts Level 2

Student Performance Goal

Given:

A completely assembled and operational shock strut (installed on an airplane or mock-up), the airplane manufacturer's service information, replacement high-pressure air valves and seals, hydraulic fluid, and appropriate tools and equipment to disassemble and inflate shock struts.

Performance:

The student will deflate a shock strut, drain the fluid, remove the piston from the cylinder, install seals, reassemble the strut, service with fluid, reinstall the air valve and inflate the strut. He will locate and interpret information from the service instructions and explain the probable causes of faults normally encountered in the operation of struts.

Standard:

The servicing procedures will be followed without deviation. The shock strut following service and repair will meet return to flight standards. The service information pertaining to troubleshooting the strut will be interpreted without error.

- L. Describe the operation of an oleo shock strut Level 2

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## Student Performance Goal

### Given:

Shock struts of the air-oil and spring-oil types, drawings of each type of strut and the manufacturer's service instructions; a matching type ten question examination pertaining to shock struts.

### Performance:

The student will identify and label the components of each type of shock strut, explain the purpose of shock struts and describe the operation of both types of struts.

### Standard:

Correct nomenclature will be used when labeling the drawings and describing the operation of the shock struts. Manufacturer's service information will be interpreted without error or omissions.

M. Operate, inspect and adjust a retractable landing gear

Level 3

## Student Performance Goal

### Given:

An operational retractable landing gear (installed in an airplane or mock-up), written information or the manufacturer's service manual, an appropriate power source to permit operation of the gear, special tools and lubrication equipment as specified in the service information, mirrors, lights, measuring devices, etc.

### Performance:

The student will operate the retractable landing gear, inspect and adjust the landing gear to meet return-to-service standards.

### Standard:

The components of the landing gear need not be airworthy, but the adjustments and procedures outlined in the service manual will be followed within return-to-service limits.

N. Check landing gear alignment

Level 2

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### Student Performance Goal

#### Given:

An aircraft incorporating either a fixed or retractable landing gear, the airframe manufacturer's service information necessary to check landing gear alignment and the necessary measuring and alignment tools and equipment.

#### Performance:

The student will measure and record the caster, camber, toe-in and toe-out of the landing gear. Within the tolerance specified in the service information, he will judge whether the landing gear is accept-able for return-to-flight. If the alignment of the landing gear is unacceptable, he will interpret the service information and recommend the method that would return the gear alignment to acceptable limits.

#### Standard:

Service information will be correctly interpreted and procedure for measuring gear alignment will be followed without error.

- O. Inspect, adjust and service nose and tail wheel steering and damping mechanisms Level 3

### Student Performance Goal

#### Given:

An airplane or mock-up incorporating an operational nose wheel steering and dampener; an airplane or mock-up incorporating an operational tail wheel and shimmy dampener; the manufacturer's servicing information, tools and hydraulic fluids.

#### Performance:

The student will inspect, adjust and service both nose and tail wheel steering and damping mechanisms.

#### Standard:

Service information will be correctly interpreted. After servicing and adjusting the steering and damping mechanism will function as specified in the manufacturer manual.

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## Hydraulic and Pneumatic Power Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-B)

30. Repair hydraulic and pneumatic power systems components  
(EIT = 15 hrs, T = 7 hrs, L/S = 8 hrs) Level 3

A. Select and install seals Level 2

### Student Performance Goal

#### Given:

Hydraulic components not requiring, complex assembly, disassembly, (i.e., master and wheel brake cylinders, actuating cylinders, etc.) various types and sizes of seals and fluids, reference information describing the procedure for replacing and testing seals in a hydraulic unit and a means for testing the following seal replacement.

#### Performance:

The student will use and interpret information that will assist in identifying and selecting seals for use in ester, petroleum and vegetable base hydraulic fluids. He will install seals in one unit in accordance with the procedures specified in the manual and test the unit following reassembly.

#### Standard:

The unit which has had the seals replaced will function as it was designed to operate and will be free of both external and internal leaks.

B. Identify, remove and install a hydraulic selector valve Level 2

### Student Performance Goal

#### Given:

An operational hydraulic system or a segment including at least a source of hydraulic pressure, a selector valve and actuating cylinder, written service instructions, a spare selector valve for installation into the system, line cap-plugs and a supply of hydraulic fluid.

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Performance:

The student will identify, remove and install a selector valve into the system. He/She will operationally check the system following placement of the selector valve.

Standard:

The selector valve will be identified regardless of the type of valve. The removal and Installation procedures will be adhered to without error or omission. The system will function as it was designed to operate.

C. Remove and install pressure regulators

Level 2

Student Performance Goal

Given:

Operational hydraulic system, written reference information, a replacement pressure regulator, line cap-plugs and a supply of hydraulic fluid.

Performance:

The student will identify, remove and install a pressure regulator in the hydraulic system. He will test the system following installation of the regulator and adjust the pressure of the system.

Standard:

The procedures will be fully in accordance with the written instructions. The pressure will be adjusted within the tolerance specified in the instructions.

31. Identify and select hydraulic fluids  
(EIT = 2 hrs, T = 1 hr, L/S = 1 hr)

Level 3

A. Identify and select hydraulic fluids

Level 3

Student Performance Goal

Given:

Samples of ester-base, petroleum-base and vegetable- base hydraulic fluids; sample placards of the type used or attached to hydraulic reservoirs; written reference information describing the characteristics and identifying features of hydraulic fluids.

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Performance:

The student will distinguish between the sample fluids by color, odor and specification number. When shown the sample placard or reservoir data plate, he/she will select the fluid that would be used to service the system. He/she will describe the characteristics of each type of hydraulic fluid.

Standard:

The three types of fluids will be identified without error. Reference information and placards will be correctly identified. Correct nomenclature will be used when describing the characteristics of the fluid.

32. Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems

(EIT = 55 hrs, T = 25 hrs, L/S = 30 hrs)

Level 3

A. Solve problems involving force, area and pressure

Level 2

Student Performance Goal

Given:

Ten problems (sketches, drawings or narrative), illustrating the relationship of applied force, area of cylinder or piston and pressure per unit area.

Performance:

The student will solve the problems when one of the factors is unknown or the values have been changed. He/She will explain the hydraulic principles involved in the solution of the problem.

Standard:

Eight of the ten problems will be correctly solved. Correct nomenclature and terminology will be used throughout the explanations.

B. Interpret reference information pertaining to operation of a basic hydraulic system

Level 2

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Student Performance Goal

Given:

Reference manuals, drawings, diagrams, mock-ups, or components installed in an aircraft system, including but not limited to: reservoir pumps, actuating cylinders, check valves, selector valves, relief valves, regulators, accumulators, fuse, flap overload valve, sequence valve, cross-flow valve, shuttle valve and pressure gauges.

Performance:

The student will interpret the reference information and diagram a basic hydraulic system. He/She will show and explain the relationship, purpose and function of each component in the system.

Standard:

Reference information will be interpreted without errors. Correct nomenclature and terminology will be part of all explanations and descriptions.

- C. Compare constant pressure and open center types of hydraulic systems

Level 2

Student Performance Goal

Given:

Charts, manuals, mock-ups or complete aircraft hydraulic systems of the constant pressure and the open center types.

Performance:

The student will identify each type of system and compare the components and the means of system pressure regulation.

Standard:

The reference information will be interpreted and comparison made without error. All explanations and descriptions of operation will include use of correct nomenclature and terminology.

- D. Inspect and service hydraulic reservoirs

Level 3

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### Student Performance Goal

Given:

An operational hydraulic system or mock-up Provided with a vented or a pressurized reservoir; a supply of hydraulic fluids and written inspection and service instructions applicable to the specific system.

Performance:

The student will inspect and service the reservoir with fluid and check the filter for contamination.

Standard:

The inspection and servicing procedure will be fully in accordance with the servicing instructions.

- E. Identify and describe the operation of constant and variable displacement hydraulic pumps Level 2

### Student Performance Goal

Given:

Visual aids manuals and a sample or cutaway of a constant and variable displacement type hydraulic power pump.

Performance:

The student will Identify and describe the operation of one pump of each type.

Standard:

Reference Information will be correctly interpreted. Correct nomenclature will be used when identifying and describing pump operation.

- F. Check, inspect, remove and install hydraulic power pumps Level 3

### Student Performance Goal

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Given:

An operational hydraulic system installed, in an aircraft or on a mock-up; three engine driven Hydraulic pumps, at least one of which has a worn or sheared drive shaft; a suitable accessory drive pad and written instructions describing the inspection, installation and removal of the hydraulic pump.

Performance:

The student will inspect the pump drive shafts and identify the pump with the defective shaft. He will remove and install a pump on the accessory drive pad and check operation of the system, following pump installation.

Standard:

The pump with the defective shaft will be identified without error. Reference information will be correctly interpreted. Removal, installation and checking will be in accordance with the written procedures.

G. Troubleshoot hydraulic pumps

Level 3

Student Performance Goal

Given:

An operational hydraulic system that may be supplied with pressure from an auxiliary power source and written service information.

Performance:

The student will troubleshoot the hydraulic system after the instructor has introduced air into the pump. The student will prime the pump and purge air from the system.

Standard:

The procedures will be in accordance with the reference information. The pump and system, will operate as specified following correction of the fault.

H. Remove, install, inspect, service and check hydraulic accumulator

Level 3

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## Student Performance Goal

### Given:

An operational constant pressure hydraulic system including one at least a power supply pump, pressure regulating devices, accumulators, flow control valves, actuators and the manufacturer's publication applicable to the specific system.

### Performance:

The student will remove, inspect and install an accumulator in the system, he/she will charge the accumulator with air or nitrogen and check the operation of the system. He/She will replace high-pressure air valve assemblies as necessary.

### Standard:

All tasks will be accomplished in accordance with the manufacturer's maintenance instructions. The system will, following servicing, comply with all operational specifications established in the written service instructions.

- I. Troubleshoot and determine the cause of low, high or fluctuating system hydraulic pressure Level 3

## Student Performance Goal

### Given:

An operational hydraulic system including at least a power supply pump, pressure-regulating devices, accumulators, flow control valves, actuators and the manufacturer's publications applicable to the specific system.

### Performance:

The student will operate the system, compare the operating characteristics with the reference information, and detect low, high or fluctuating pressures when faults are introduced into the system by the instructor. He/She will interpret information from the service publications and describe the probable cause for the observed malfunction. He/She will make necessary adjustments to restore the system to operating tolerances.

### Standard:

Operation, adjustments and analysis of faults will be in accordance with the written reference information. Following observance and analysis of faults, the system will be restored to operating tolerances specified in the instructions.

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- J. Inspect, check and service a hydraulically operated flap system Level 2

Student Performance Goal

Given:

An operational hydraulic flap system installed in the aircraft or on a mock-up, and the manufacturer's maintenance and service publications or written reference material.

Performance:

The student will inspect, check and service the flap system.

Standard:

The tasks will be accomplished in accordance with the written instructions and will result in a system that operates within the tolerances specified in the instructions.

### **Cabin Atmosphere Control Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-C)

33. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, pressurization systems, and air cycle machines  
(EIT = 14 hrs, T = 14 hrs, L/S = 0 hrs) Level 1

- A. The inspection, checking and troubleshooting of aircraft combustion heaters and exhaust type heat exchangers Level 1

Student Performance Goal

Given:

Written information, schematic diagrams and questions with multiple-choice answers concerning aircraft cabin pressurization.

Performance:

The student will select answers for 14 questions concerning the basic principles of cabin pressurization and how it is controlled, the relationships of cabin pressure to ambient pressure during a flight, the purposes and operation of check valves in delivery air ducts, outflow valves, emergency relief valves, and negative pressure relief valves.

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Standard:

Select correct answers for at least ten questions.

- B. The checking and troubleshooting of aircraft vapor cycle and air cycle cooling systems

Level 1

Student Performance Goal

Given:

Written information and diagrams of an aircraft air conditioning system.

Performance:

The student will write a brief description of the functions of each of the following components in an air conditioning system: the supercharger or compressors the mixing valve, the intercooler or primary heat exchanger, the passenger's cold air distribution system cabin and duct sensors, ambient air sensor, main distribution ducts, cabin air inlet louvers, cabin air exhaust outlets, outflow valve, recirculation fan, and ground blower.

Standard:

At least eight descriptions will be in accordance with information provided.

- C. The functions and principles of operation of aircraft air conditioning

Level 1

Student Performance Goal

Given:

Written information and questions with multiple-choice answers concerning aircraft surface combustion heaters and exhaust-type heat exchangers.

Performance:

The student will select answers for ten questions with regard to surface combustion heater operating principles and shooting, exhaust-type heat exchanger operation and troubleshooting, inspection requirements of cabin heating systems.

Standard:

Select correct answers for at least seven questions.

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D. The principles of operations and control of cabin pressurizations Level 1

Student Performance Goal

Given:

Written information, unlabeled diagrams, and completion type essay statements relative to aircraft vapor-cycle and air-cycle cooling systems.

Performance:

The student will inspect labels in spaces provided to identify components in diagrams of a Freon vapor- cycle aircraft refrigeration system and an air-cycle aircraft cooling system. He will complete essay statements concerning Freon system components, air- cycle machine components, and checking, troubleshooting and servicing aircraft cooling systems.

Standard:

Correct labels and completion words for at least 70 percent of the spaces provided.

34. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, and pressurization systems (EIT = 9 hrs, T = 9 hrs, L/S = 0 hrs) Level 1

A. Identify components of an aircraft combustion heater, Freon cooling system, and an air cycle expansion turbine Level 1

Student Performance Goal

Given:

Written information, unlabeled cut-away drawings, and questions with multiple-choice answers.

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Performance:

The student will identify and label the following items in a cut-away drawing of a surface combustion heater: fuel and combustion air inlets, ventilating air inlet and outlet, exhaust, fuel nozzle, spark plug, overheat and drop-out thermal switches; and show flow patterns by arrows. He will identify and label the major components of a Freon vapor-cycle cooling system. He will identify and label the following items in an air-cycle cooling system: turbine air intake and outlet, turbine, axial flow fan, fan air intake and outlet, oil reservoir, bearing and oil wick, primary and secondary heat exchangers, and show air routings through the turbine, heat exchangers and fan outlet section.

Standard:

Correct labels and arrows for at least 70 percent of the specified items.

- B. Repair or replacement procedures for air conditioning and pressurization components Level 1

Student Performance Goal

Given:

Manufacturer's service manuals or equivalent written material and samples or drawings of air condition and pressurization system components.

Performance:

The student will identify samples or drawings of the following components and list reference page numbers for repair or replacement information for ten of the components identified: cabin supercharger or compressor, air delivery duct check valve, cabin air mixing valve and its actuator, cabin temperature control unit and instruments, outflow valve, and actuator, pressure control unit and instruments, automatic and manual emergency relief valves, cabin ground blower, recirculation fan, and cabin vacuum (negative pressure) relief valve.

Standard:

Correctly identify at least ten components and list correct reference page numbers for repair or replacement information for at least 7 components.

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- C. Repair or replacement procedures for aircraft oxygen system components Level 1

Student Performance Goal

Given:

Manufacturer's service manuals, AC 43.3.13-2, or equivalent publications, samples or drawings of oxygen system components and multiple choice questions.

Performance:

The student will select answers to ten questions dealing with repair or replacement of oxygen system components, including oxygen high pressure bottles and regulators, walk around oxygen bottles and regulators, flight crew oxygen masks and flow regulators, passenger oxygen masks and therapeutic oxygen equipment.

Standard:

Select 8 correct answers.

35. Inspect, check, troubleshoot, service, and repair oxygen systems (EIT = 7 hrs, T = 3 hrs, L/S = 4. hrs) Level 2

- A. Inspect, check and service oxygen systems Level 2

Student Performance Goal

Given:

Manufacturer's service manual or equivalent written information, check sheet or work card, an aircraft or mock-up with an operative oxygen system.

Performance:

The student will check the oxygen system for leakage, check bottle pressure and replace a high-pressure oxygen bottle, check oxygen system pressure, inspect masks for contamination and check an oxygen mask and regulator for proper operation.

Standard:

All Performance will be in compliance with the check sheet or work card provided.

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## Aircraft Instrument Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-D)

36. Inspect, check, service, troubleshoot, and repair electronic flight instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position indicating systems to include the use of built-in test equipment

(EIT = 9 hrs, T = 4 hrs, L/S = 5 hrs)

Level 1

A. Inspect, check, service, troubleshoot and repair instrument systems

Level 1

Student Performance Goal

Given:

Manufacturer's service manuals or diagrams and written descriptions of a compass system, airspeed/altitude/rate of climb system, gyro attitude systems, temperature/ pressure/ positioning systems, appropriate operational instrument systems mounted in an airplane or mock-up.

Performance:

The student will inspect, check, service, troubleshoot and repair one system, which has been made faulty by an action of the instructor.

Standard:

The student will interpret the written information, correctly identify and correct the fault in the system.

37. Install instruments and perform a static pressure system leak test

(EIT = 11 hrs, T = 5 hrs, L/S = 6 hrs)

Level 2

A. Handling and storing of instruments

Level 2

Student Performance Goal

Given:

A random display of aircraft instruments, including direct pressure indicating instruments, gyro instruments, temperature indicating instruments, compasses, and remote indicating indicators and transmitters; suitable cartons or storage containers, sealing plugs and shock absorbing shipping materials.

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**Performance:**

The student will remove at least three instruments from the display panel or mock-up, seal all openings to the instrument, attach an identification tag and prepare the instrument for storage or shipment.

**Standard:**

The task of removing and identifying and preparing the instrument for storage or shipment will demonstrate precautions that will prevent further damage to the instrument.

- B. Install instrument panel and instruments Level 2

**Student Performance Goal**

**Given:**

An airplane or mock-up provided with mounting brackets, an instrument panel, with instruments installed, appropriate panel shock mounts; written reference information describing the number, type, and load rating and procedure for installing the shock mounts and panel.

**Performance:**

The student will install the shock mounts, panel and instruments into the airplane or mock-up.

**Standard:**

The panel and instruments need not meet return-to-flight standards, but the installation of mounts; panel and instruments will fully comply with the written installation instructions.

**Communication and Navigation Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-E)

- 38. Inspect, check, and troubleshoot autopilot, servos, and approach coupling systems  
(EIT = 5 hrs, T = 5 hrs, L/S = 0 hrs)

Level 1

- A. Purpose and operating principles of autopilots and approach control systems

Level 1

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Student Performance Goal

Given:

Manufacturer's manuals, written information, and multiple completion essay statements.

Performance:

The student will complete 14 essay statements, by supplying missing words, concerning the purposes and operation of an autopilot, the operating principles of the sensing devices used to provide heading, attitude, and altitude information to the autopilot, the purpose and operation of servos or servomotors, the function of position transmitters and trim indicators, and the purpose and operation of an approach control system.

Standard:

Correctly complete 10 essay statements.

- 39. Inspect, check, and service aircraft electronic communication and navigation systems, including VHF passenger address interphones and static discharge devices, aircraft VOR, ILS, LORAN, Radar beacon transponders, flight management computers, and GPWS  
(EIT = 5 hrs, T = 5 hrs, L/S = 0 hrs)

Level 1

- A. Types and installation of aircraft electronic communications and navigation equipment

Level 1

Student Performance Goal

Given:

AC 43.13-1&2 or equivalent published information, and questions with multiple-choice answers.

Performance:

The student will select answers for 20 questions concerning electronic communications and navigation systems. The questions will deal with types of equipment used in various aircraft, where and how the equipment is mounted, cooling, and reduction of electrical reference.

Standard:

Select at least 14 correct answers.

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B. FCC regulations pertaining to two-way radio operation

Level 1

Student Performance Goal

Given:

FCC regulations pertaining to aircraft radio operation, or an equivalent publication and questions concerning these regulations.

Performance:

The student will write answers to 10 questions concerning the operation of aircraft and ground radio transmitters, FCC regulations pertaining to radio transmissions acceptable practices and vocabulary usage, proper recognition and acknowledgement techniques and rules covering display of licenses.

Standard:

Correct answers for at least 7 questions.

40. Inspect and repair antenna and electronic equipment installations

(EIT - 10 hrs, T = 5 hrs, L/S = 5 hrs)

Level 2

A. Repair and replace aircraft antennas and related electronic equipment

Level 2

Student Performance Goal

Given:

Manufacturer's manuals, AC 43.13-1, AC 43.9-1A, AC 43.13-2 or equivalent publications, an aircraft or mock-up with electronic installations which use fixed wire, blade or whip, and flush mounted antennas, and questions with multiple choice answers pertaining to PAR procedures after major repair or alteration has been accomplished.

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Performance:

The student will locate repair and replacement information for a fixed wire antenna, a blade or whip antenna, and a flush type antenna. Using this information, he will replace one antenna and related electronic Equipment and repair one other antenna, which has been intentionally damaged by the instructor, He will select answers to 6 questions pertaining to PAR requirements for returning an aircraft to service after a radio installation has been made in accordance with approved data.

Standard:

Locate proper information and perform replacement and repairs in accordance with published procedures and specifications for return-to-flight. Select correct answers for at least 5 questions.

B. Identify and describe purpose of static discharges      Level 2

Student Performance Goal

Given:

Written information, AC 43.13-1 (or equivalent publication) sample static dischargers on an aircraft or mock-up and drawings of static dischargers which include carbon impregnated braid types, metallic braid types, null-field types, and an ohmmeter.

Performance:

The student will identify each of the three types of static dischargers and write a brief description of how each type performs its intended function. He will also describe how each type is to be inspected and what wear or damage indications require repairs or Replacement and then will inspect the mounting and test the epoxy bond resistance.

Standard:

At least two identifications, two descriptions of functions and two descriptions of repair procedures will be correct, in accordance with information provided.

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## Aircraft Fuel Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-F)

### 41. Check and service fuel dump systems

(EIT = 1 hr, T = 1 hr, L/S = 0 hrs)

Level 1

- A. Describe the checking and servicing of a fuel dump system

Level 1

#### Student Performance Goal

#### Given:

Visual aids and the technical data available from the manufacturer's service publications.

#### Performance:

The student will locate information in the reference publications and describe the checking and servicing of a fuel dump system.

#### Standard:

Correct nomenclature and terminology will be used as a part of the description of operation.

### 42. Perform fuel management transfer and defueling

(EIT = 2 hrs, T = 2 hrs, L/S = 0 hrs)

Level 1

- A. Perform fuel transfer and defueling

Level 1

#### Student Performance Goal

#### Given:

Schematic diagrams or mock-ups of a fuel system that incorporates provisions for cross feed, fuel transfer and the service publications associated with the specific system.

#### Performance:

The student will locate information in the appropriate technical publication and describe the procedures necessary to transfer or cross feed fuel and defuel the system.

#### Standard:

Correct nomenclature and terminology will be used as a part of the description of operation.

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43. Inspect, check, and repair pressure fueling systems  
(EIT = 2 hrs, T = 2 hrs, L/S = 0 hrs) Level 1
- A. Describe the inspection, checking and repair of pressure fueling systems Level 1
- Student Performance Goal
- Given:  
Visual aids, mock-ups and technical data as would be available from the manufacturer's service manual.
- Performance:  
The student will describe the procedures to be followed when inspecting, checking and repairing pressure type fueling systems,
- Standards:  
Reference publications will be used during the descriptions. Correct nomenclature and terminology is required as a part of the descriptions.

44. Repair aircraft fuel system components  
(EIT = 10 hrs, T = 5 hrs, L/S = 5 hrs) Level 2
- A. Interpret information pertaining to repair of fuel system components Level 2
- Student Performance Goal
- Given:  
Typical aircraft fuel tanks of the separate metal types, flexible bladder types and integral type; fuel strainers, selector valves, fuel lines of the solid metal and flexible hose types, fuel drains, appropriate reference information, and ten written questions pertaining to repair of fuel system components.
- Performance:  
The student will locate and interpret information from the manuals and describe the repair procedures for fuel system components as specified in the ten written questions.
- Standard:  
The repair procedures will be interpreted without error. Correct nomenclature and terminology will be used as a part of all descriptions.

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45. Inspect and repair fluid quantity indicating systems  
(EIT = 6 hrs, T = 3 hrs, L/S = 3 hrs) Level 2

A. Inspect and troubleshoot fuel quantity indication systems Level 2

Student Performance Goal

Given:

An operational fuel quantity indicating system of the direct reading (sight gauge or Mechanical float) and a remote indicating electrical type; appropriate reference information and ten statements describing malfunctions of "the systems.

Performance:

The student will inspect the operating systems, correctly interpret information from the manuals and describe the repair that would be undertaken to correct the malfunctions described in the ten statements.

Standard:

The repair practices and recommendations of the manual will be interpreted without error. Correct nomenclature will be used as part of all described repairs.

46. Troubleshoot, service, and repair fluid pressure and temperature warning systems  
(EIT = 2 hrs, T = 1 hr, L/S = 1 hr) Level 2

A. Troubleshoot, service, and repair fuel pressure and temperature warning systems Level 2

Student Performance Goal

Given:

An operating fuel system installed in an airplane or on a mock-up, including a pressure and temperature warning system, a schematic or diagram of the system and the service information applicable to the specific system.

Performance:

The student will operate the system and adjust the pressure or temperature sensing devices. He will interpret information from the service information and identify the cause of an instructor-introduced fault in the system. He will repair the system as directed in the service manual.

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Standard:

A troubleshooting, servicing, and repair of the warning systems will be in accordance with the service publications. The information contained in the manuals will be interpreted without error.

47. Inspect, check, service, troubleshoot, and repair aircraft fuel systems

(EIT = 13 hrs, T = 6 hrs, L/S = 7 hrs)

Level 3

A. Inspect and service, fuel tanks

Level 3

Student Performance Goal

Given:

Fuel tanks of the separate metal types, flexible bladder types and an integral type, appropriate service information and copies of the applicable Federal Aviation Regulations.

Performance:

The student will inspect each of the three different types of tanks. Using reference information, he will describe the construction characteristics, the installation and servicing precautions for each type of tank.

Standard:

The inspection will be accomplished as specified in the servicing manuals. Correct nomenclature and terminology will be used as a part of the description of construction, installation and servicing.

B. Inspect, check, service, troubleshoot and repair fuel valves and fuel pumps

Level 3

Student Performance Goal

Given:

An operational fuel system or test bench mock-up, manually operated fuel valves, engine driven fuel pumps, wobble pumps, electrical fuel pumps, service information pertaining to operation and troubleshooting of fuel valves and pumps.

Performance:

The student will inspect, check, service, troubleshoot and repair each type of valve and pump.

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Standard:

Each unit will function within the tolerance provided and be free of leaks and other hazards, but need not meet return to flight standards.

**Aircraft Electrical Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-G)

48. Repair and inspect aircraft electrical system components, crimp and splice wiring to manufacturers' specifications, and repair pins and sockets of aircraft connectors  
(EIT = 24.5 hrs, T = 13.0 hrs, L/S = 11.5 hrs)

Level 2

A. Determine causes and effects of switch chatter in solenoid switches and relays

Level 2

Student Performance Goal

Given:

Written information, samples of solenoid switches and relays, which have been subjected to switch chatter to varying degrees of severity.

Performance:

The student will inspect ten solenoid switches and relays, which have been damaged to varying degrees by switch chatter arcing, list the probable causes, extent of damage and repair ability for each sample.

Standard:

At least seven samples will be correctly listed as to cause and extend of damage and reparability.

B. Inspect installation and check circuits and anti-collision and positions lights

Level 2

Student Performance Goal

Given:

An aircraft or mock-up anti-collision and navigation position lights Installed and operative, manufacturer's information, AC 43.13-2 or equivalent publication.

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Performance:

The student will inspect the installation and check the circuits of the anti-collision and position lights as installed on the aircraft or mock-up. He will make a list of five installations or circuit requirements for each type of light and note whether each requirement listed has been satisfied in the installation inspected.

Standard:

Correct listing of ten requirements and correct decisions noted for eight requirements.

- C. Inspect, check, and repair landing and taxi light installations

Level 2

Student Performance Goal

Given:

Manufacturer's service information, an aircraft or mock-up with retractable pre-focused landing lights and a pre-focused taxi light installed and operable, replacement pre-focused lamps, suitable tools and test equipment.

Performance:

The student will inspect and check the installation, circuit, and operation of landing lights, including extension and retraction of the lights. He will replace a pre-focused landing light lamp and adjust the extension limit switches. He will inspect, check and repair a taxi light installation by replacing a lamp.

Standard:

All work will be accomplished to return-to-service level in accordance with information provided.

- D. Inspect, check, service and repair aircraft interior lighting installations

Level 2

Student Performance Goal

Given:

Written information, manufacturer's manuals, a mock-up of several types of aircraft Interior lighting, including DC dome and reading lights, AC series type cabin lights, and a fluorescent light, suitable tools and test equipment, re-placement lamps.

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**Performance:**

The student will draw circuit diagrams for the following aircraft lighting systems: A DC cabin light system with three dome lights, four seat reading lights, and an entry light; an AC cabin light system with 28 volt lights in a series-parallel circuit for 115 volts AC; and a fluorescent type cabin lighting system. He/She will inspect, check voltages and replace lamps in a DC dome light, a seat reading light, an AC series light system and a light fixture on an operative mockup, fluorescent.

**Standard:**

At least two of the three circuit diagrams will be correctly drawn in accordance with information provided. Inspection, checking, and lamp replacement will be at a return-to-service level and in accordance with manufacturer's manuals provided.

- E. Inspect, check, service and repair cockpit lights and lighting circuits

Level 2

**Student Performance Goal**

**Given:**

Written information, manufacturer's manuals, a mock-up or aircraft with typical cockpit lighting, replacement lamps or assemblies, and suitable tools and test equipment.

**Performance:**

The student will inspect, check, and make lamp or light assembly replacements for ten different types of cockpit or instrument lighting installations. He will replace an inoperative overhead or panel type cockpit lighting fixture and repair an instrument light circuit in which the instructor has introduced an open connection.

**Standard:**

At least eight lighting installations will be properly inspected, checked for proper operation, and lamp replacement correctly made. Repairs to overhead or panel light and instrument light circuit will be accomplished to return-to-service standards.

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- F. Inspect and check electrical equipment installations f  
or integrity of mounting and connections Level 2

Student Performance Goal

Given:

Manufacturer's service manual or equivalent written information concerning shock mounting of electrical equipment, quick disconnect plug-in connectors for electrical units, and methods of securing equipment on shelves or racks, an aircraft or mock-up with electrical Units mounted on shelves or racks.

Performance:

The student will inspect electrical equipment installations on shelves or racks for security of lock-in, integrity of shock mounting, and Clearance from other equipment. He/She will check the plug-in connectors for proper mating and adequate engagement and assure that all requirements for cooling or ventilation are satisfied.

Standard:

Procedures for inspecting and checking the installations will be conformed to in accordance with information provided.

- G. Inspect, check, and repair passenger call system Level 1

Student Performance Goal

Given:

Written information or manufacturer's service data and questions with multiple-choice answers concerning passenger call systems.

Performance:

The student will select answers to ten questions concerning the inspection, checking, and repair of passenger call systems.

Standard:

At least seven correct answers will be selected.

- H. Locate replacement procedures and parts numbers  
for electrical component replacements Level 2

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Student Performance Goal

Given:

A service manual and parts catalog for a specific aircraft, a list of five electrical components supplied by the instructor.

Performance:

The student will locate and list the reference page numbers of the replacement procedures for each of the five listed components. He/She will also list the part Numbers of the replacements for the five components and Of any additional mounting hardware, seals or gaskets Required for replacement.

Standard:

At least 80 percent of the listed reference page numbers and part numbers will be correct.

- 49. Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices (EIT = 42.5 hrs, T = 18.5 hrs, L/S = 24 hrs) Level 3
- A. Types and characteristics of aircraft fuses, circuit breakers and switches Level 1

Student Performance Goal

Given:

Written information, AC 43.13-1 or equivalent FAA publication, questions concerning electrical fuses, circuit breakers J and switches.

Performance:

The student will select answers for twenty questions dealing with the types, purposes, applicability and operation of electrical fuses, circuit breakers, and switches in aircraft.

Standard:

Select at least fourteen correct answers.

- B. Select and install aircraft electrical switches and wiring to components Level 3

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## Student Performance Goal

### Given:

Written information, AC 43.13-I or equivalent publication, a mock-up with provisions for mounting components and switches, aircraft electrical components, assorted aircraft electrical wire and switches, a DC power supply, an AWG wire gauge and suitable electrical tools. DC power supply, an AWG wire gauge and suitable electrical tools.

### Performance:

The student will connect the following aircraft electrical components to the power-supply through suitable switches: a retractable landing light with relay controlled filament, a heavy duty motor controlled by a relay, a wing tip light, a reversible motor, and a solenoid type relay for control of external electric power. He/She will select wire of proper gauge for one-half volt drop, secure wires by clamps and tying, and check each circuit for proper operation.

### Standard:

Switches and electrical wiring will comply with specifications provided. Work performance will meet safety standards and all components will operate properly.

- C. Installation requirements and characteristics for aircraft electrical wiring systems and junction boxes Level 2

## Student Performance Goal

### Given:

Written information, AC 43.13-1 or equivalent publication, questions with multiple choice answers, samples of acceptable and unacceptable aircraft electrical cable terminals of various types.

### Performance:

The student will select answers to 16 questions pertaining to the characteristics of single-wire electrical systems, the strength requirements for electrical cable terminals, the purpose, applicability, and use of terminal strips, installation requirements for junction boxes, the criteria for selecting aluminum or copper wire, and the purposes of shielding electrical wiring and equipment. He will inspect 10 electrical terminals and receptacle 'acceptability' of each with reasons for rejection of unacceptable terminals.

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Standard:

Select correct answers for at least 12 inspect questions and at least 7 terminals judged correctly with correct reasons where rejected.

- D. Install electrical terminals, splices and bonding jumpers

Level 3

Student Performance Goal

Given:

AC 43.13-1 or equivalent publication, manufacturer's instructions dealing with electrical terminals, assorted samples of aircraft wire and cable, terminals, splices, sleeving, bonding, jumpers, a mock-up with aircraft components requiring bonding, and appropriate tools and equipment for soldering and crimping.

Performance:

The student will install five soldered and ten crimped terminal lugs on aircraft cable, including two on aluminum cable, splice cables with two soldered splices and three crimped splices, select and install five bonding jumpers for aircraft components which require bonding.

Standard:

At least 80 percent each of the terminals, splices and bonds will meet specifications in AC 43.13-1 or manufacturer's instructions.

- E. Install aircraft electrical wiring in a conduit

Level 2

Student Performance Goal

Given:

Written instructions, a mock-up or aircraft with a section of conduit having bends and Terminating in junction boxes at each end, with damaged wiring installed through the conduit and connected to terminals at each end and a circuit diagram for the conduit wiring.

Performance:

The student will remove the damaged wiring from the conduit, and clean the conduit as necessary. He will prepare and install wiring through the conduit and connect the cables to the terminals at each end to complete the circuits shown in the diagram provided.

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Standard:

The cables will be installed in accordance with the instructions provided and each circuit will show correct continuity in accordance with the diagram.

- F. Check and connect quick-disconnect plugs and receptacles

Level 2

Student Performance Goal

Given:

Written information, AC 43.13-1 or equivalent publication, questions with multiple choice answers concerning the use of quick-disconnect plugs, samples of aircraft connector plugs and mating receptacles, some of which have defective pins or sockets, tools or test equipment for checking pins and sockets.

Performance:

The student will select answers for 14 questions dealing with the use of aircraft electrical quick disconnect plugs and receptacles, checking pins and sockets, tightening and securing or safetying quick-disconnect connectors, and purposes of various types of inserts, seals, sleeves and grommets used in plugs and receptacles. He will check pins and sockets in connectors and locate five which are defective, write down reasons for rejections, select five mating plugs and receptacles and connect each pair together, safetying two at tie points provided.

Standard:

Select correct answers for ten questions. Four defective pins or sockets will be correctly located and have acceptable reasons given, and all mated connectors will be correctly selected and secured. Safeties installed will meet return-to-flight standards.

- G. Protect electrical emergency switches against accidental actuation

Level 3

Student Performance Goal

Given:

Written information, a mock-up or airplane with guarded and safetied type switches for electrically controlled emergency systems.

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Performance:

The student will close three guarded switches, two of which have guards safetied open and three non-guarded switches, safetied open. He will reset the guards on each guarded switch and install safety wires on the two guards which were previously safetied. He will re- safety the three--non-guarded switches, using breakaway wire for all safeties.

Standard:

Each switch will be reset correctly and each guard will be reset properly. All five safeties will be correctly made with approved wire.

- H. Identify and describe characteristics of aircraft high tension and low tension electrical wiring Level 2

Student Performance Goal

Given:

Samples of aircraft high-tension cables for spark plug leads, and for igniter leads, low-tension cables for 12 volt to 208 volt electric cal systems wiring low-tension ignition primary leads and thermocouple leads, a chart showing kinds of wire and characteristics of each, and manufacturer's wire and cable information.

Performance:

The student will select five samples of high-tension wire and ten samples of low-tension wire including thermocouple leads. Using the chart as a guide, he will prepare a label for each sample giving description of wire type and characteristics for each type.

Standard:

At least three kinds of high-tension wire and seven kinds of low-tension wire will be "correctly labeled. Characteristics will be correctly described for at least ten types of wire.

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50. (a) Inspect, check, troubleshoot, service, and repair alternating and direct current electrical systems (EIT= 36 hrs, T = 17.5 hrs, L/S = 18.5 hrs) Level 3
- (b) Inspect, check, and troubleshoot constant speed and integrated speed drive generators (EIT= 2 hrs, T = 2 hrs, L/S = 0 hrs) Level 1
- A. Methods of controlling output current and voltage of compound DC generators Level 2

Student Performance Goal

Given:

Written information, schematic diagrams, unlabeled diagrams, and questions with multiple-choice answers.

Performance:

The student will select answers to 20 questions concerning methods for controlling single and multiple generator DC aircraft electrical systems. He will select answers concerning vibrator and carbon pile voltage regulators, regulation of voltage and current in single and multiple generator systems, reverse current cutout relays and effects of sticking points in such relays, over-voltage and overload protection. On unlabeled diagrams of single and two generator DC aircraft electrical systems, he will show by labels, or arrows, how voltage and current are controlled in compound DC generator systems and how equalization of load is accomplished in an aircraft electrical system having two DC generators.

Standard:

Select correct answers for at least 15 questions and at least 75 percent of diagram labels will be accurate.

- B. Check, troubleshoot and repair an aircraft dual DC generator electrical system Level 3

Student Performance Goal

Given:

Written information, manufacturer's instructions manual, an aircraft or mock-up with an operative DC dual generator system, appropriate tools and test equipment.

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Performance:

The student will read and record voltage and output current for each generator at various RPM, adjust the voltage regulators, adjust load equalization, flash a generator field, check the operation of the reverse current cutout relays, locate and correct at least three open or short circuit malfunctions introduced by the instructor.

Standard:

All procedures will be performed in accordance with the information and specifications provided.

- C. Methods of providing AC in aircraft having only DC electrical systems Level 1

Student Performance Goal

Given:

Written information, schematic diagrams, questions with multiple-choice answers.

Performance:

The student will select answers for 14 questions concerning methods of providing AC in aircraft that have DC electrical systems, and the operating principles and characteristics of rotating and solid state inverters.

Standard:

Select correct answers for at least 10 questions.

- D. Troubleshoot and repair a DC electrical system supplied by an alternator Level 3

Student Performance Goal

Given:

Manufacturer's service manual and schematic diagrams, an aircraft or mock-up with an operative DC electrical system supplied by an alternator with built-in rectifiers, suitable tools and test equipment.

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Performance:

The student will troubleshoot and repair a DC aircraft electrical system. He will locate and correct five malfunctions introduced by the instructor, locating and correcting each malfunction before the next is introduced.

Standard:

Four malfunctions will be located and corrected without assistance from the instructor,

E. Characteristics and advantages of AC aircraft electrical systems

Level 1

Student Performance Goal

Given:

Written information, schematic diagrams, questions with multiple-choice answers concerning AC electrical systems and components.

Performance:

The student will select answers to 20 questions dealing with the advantages of AC for aircraft electrical power systems, how frequency of an AC generator is determined, reasons for using 400 cycle AC in aircraft, operating principles and characteristics of transformers and rectifiers, and their use for obtaining DC for battery charging and other DC needs.

Standard:

Select correct answers for at least 14 questions.

F. Identify components and operating elements of a 208/114 volt AC aircraft electrical system

Level 2

Student Performance Goal

Given:

Manufacturer's instruction manual or equivalent written information, schematic and "block diagrams without labels, dealing with a 208/115 volt, 3 phase aircraft AC electrical system and constant speed drive for one generator, and label cards for major components and certain operating elements of the AC electrical system and the constant speed drive.

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**Performance:**

The student will insert an identifying label adjacent to each of 20 components or operating elements shown in the diagrams of the AC electrical system and the constant drive speed.

**Standard:**

Correctly associate at least 16 labels with the component or operating element to which each applies.

- G. Inspect, check and troubleshoot constant speed and integrated speed drive generators Level 1

**Student Performance Goal**

**Given:**

Written information, schematic diagrams, questions with multiple-choice answers concerning constant speed and integrated speed drive generators

**Performance:**

The student will select answers to 10 questions dealing with the constant speed and integrated speed drive generators.

**Standard:**

Select correct answers for at least 7 questions.

**Position and Warning Systems**

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-H)

- 51. Inspect, check, and service speed and configuration warning systems, electrical brake controls, and antiskid systems Level 2  
(EIT = 11 hrs, T = 3 hrs, L/S = 8 hrs)

- A. Principles of operation, inspection and check of speed, stall, takeoff warning systems and antiskid brake control systems Level 1

**Student Performance Goal**

**Given:**

Written information, visual training aids or diagrams, and multiple completion essay statements.

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Performance:

The student will insert words to complete 20 multiple completion essay statements explaining the principles of operation and basic methods of installation of speed or mach's warning, stall-warning, takeoff-warning and electrical/hydraulic antiskid brake control systems.

Standard:

At least 14 statements will be completed correctly.

- B. Show simulated operation of antiskid takeoff warning systems Level 2

Student Performance Goal

Given:

Animated diagrams or simulation mockups of antiskid and takeoff warning systems.

Performance:

The student will set up the various simulated switches, solenoids, and valves on an antiskid diagram for normal braking, then allow by simulation what occurs when a skid develops on one wheel and on all wheels. On a take off-warning system diagram, he/she will set up the simulated switches would cause takeoff warning if flaps were not in proper takeoff position and show at least one other cause for takeoff warning, on the diagram.

Standard:

At least one setup of switches for antiskid action will be correct and at least one cause for takeoff warning will be properly shown.

- 52. Inspect, check, troubleshoot, and service landing gear position indicating and warning systems (EIT = 9 hrs, T = 3 hrs, L/S - 6 hrs) Level 3

- A. Inspect, check, troubleshoot, service and repair landing gear position indicating and warning systems Level 3

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IV-56	0	08/01/2016	08/01/2016



## Student Performance Goal

### Given:

Manufacturer's manual or equivalent written information, and aircraft or mockup having retractable landing gear with a position indicating and warning system installed and operating.

### Performance:

The student will check the operation of the position indicating and warning light by operating the landing gear, inspect the components of the position indicating and warning system, troubleshoot and repair different malfunctions introduced by the instructor, with each malfunction being corrected before the next is introduced. The malfunctions will include one, which causes a false gear unsafe warning, two position light electrical malfunctions and one mechanical failure at a position-indicating switch.

### Standard:

Locate and repair at least three of the malfunctions to a return-to-flight level in accordance with procedures provided.

## Ice and Rain Control Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-I)

53. Inspect, check, troubleshoot, service and repair airframe ice and rain control system

(EIT = 12 hrs, T = 4 hrs, L/S = 8 hrs)

Level 2

A. Principles of installation, operation and checking deicing and anti-icing systems

Level 1

## Student Performance Goal

### Given:

Manufacturer's information or equivalent publications containing illustrations, diagrams, operating and maintenance information concerning deicing and anti-icing systems, and questions with multiple -Choice answers.

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Performance:

The student will select answers to 20 questions dealing with operating principles safety precautions and checking of deicer boots, leading edge heated air anti-icing systems for airfoils and intake ducts, and electrically operated anti-icing for air intake ducts and ports.

Standard:

Select at least 14 correct answers.

- B. Replace inspect and check operation of electrically operated air scoop and pitot static or static vent anti-icing

Level 2

Student Performance Goal

Given:

Written information, schematic diagrams, an aircraft or mock-up with electrically operated anti-icing for and air scoop and an air inlet port.

Performance:

The student will locate appropriate work procedures, remove, inspect and replace the following: an electrical air scoop leading edge, anti-icing component and an electrical anti-icing element for a pitot tube or static air vent and complete a work sheet showing work accomplished.

Standard:

Procedures following in accordance with information provided and anti-icing components reinstalled and operative at return«to-service standards and proper safety precautions adhered to in addition to proper entry in log book.

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## Fire Protection Systems

(Meets the requirements of Part 147, Appendix C-Airframe Systems and Components-J)

54. Inspect, check, service smoke and carbon monoxide detection systems

(EIT = 1 hr, T = 1 hr, L/S = 0 hrs)

Level 1

A. Principles of operation of smoke and carbon monoxide detectors

Level 1

Student Performance Goal

Given:

Written information and completion type essay statements concerning photoelectric and visual smoke detectors and chemical type carbon monoxide detectors.

Performance:

The student will complete six statements concerning how smoke is detected by photoelectric and visual methods, how air sampling is accomplished for smoke detection, and uses of chemical type CO detector buttons.

Standard:

Correctly complete at least four statements.

55. Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems

(EIT = 11 hrs, T = 4 hrs, L/S = 7 hrs)

Level 3

A. Inspect, check, troubleshoot and repair fire detection systems

Level 3

Student Performance Goal

Given:

Manufacturer's information or equivalent written information, samples or cutaway drawings of fire detectors and a mock-up with at least one type of operative aircraft fire detector system.

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Performance

The student will write a brief description of the method of operation for each of the following types of fire detectors: thermal switch thermocouple and continuous loop. On a mock-up, he will trace the circuit of a fire detection system and activate the system alarm by heat applied to a fire detector on the mock-up, he will use a tester or voltohmmeter to locate a malfunction introduced into the mock-up circuit and correct the malfunction.

Standard:

At least two written descriptions will be correct in accordance with information provided the circuit on the mock-up will be accurately traced, the alarm will operate, and the malfunction will be located and corrected to return-to-service standards.

B. Select and operate fire extinguishers

Level 2

Student Performance Goal

Given:

Written information or manufacturer's manuals, water and CO or dry powder fire extinguishers, samples of fire extinguishing agents, provisions for safely conducting fire extinguishment and materials for Class A and B fires, and questions with multiple choice answers, and excerpts from national or local fire safety regulations.

Performance:

The student will select answers to the questions dealing with proper type of fire extinguisher or extinguishment material to use for extinguishing Class A, B, and C fires and the kinds of fires included in each classification. He will select proper type of extinguisher and extinguish one trash or wood fire and one fuel fire. He will select answers to ten questions dealing with hazards and precautions in handling fire extinguishers, types of fire extinguishers in closed or poorly ventilated areas, and the characteristics of gasoline and kerosene fires and their extinguishment.

Standard:

Select at least eight correct answers for each set of ten questions, and one correct type of extinguisher each for class A and B fires. He will handle fire extinguisher and extinguish in accordance with safety regulations provided.

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C. Check, troubleshoot and repair built-in fire extinguishing systems

Level 2

Student Performance Goal

Given:

Manufacturer's or equivalent information, an aircraft or mock-up with a built-in aircraft fire extinguishing system which is electrically controlled, suitable test equipment and tools.

Performance:

The student will draw a block diagram of the built-in fire extinguishing system, label each major component showing unit name, location in aircraft and function. He will draw a simplified diagram of the electrical control circuit identifying components and listing function of each component. He will check continuity of the electrical circuit, check the pressure of the fire extinguishing agent in the container and list three possible causes for system failure to operate.

Standard:

At least 70 percent of the components will be correctly identified, properly located, and correct function shown. The electrical control circuit will be accurate in accordance with information provided. Container pressure and continuity check of the circuit will be done in accordance with procedures provided and at least two possible causes of system failure will be correctly listed.

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