Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

[Docket No. 9444; Amdts. 65-14; 147-2]

PART 65—CERTIFICATION: AIRMEN OTHER THAN FLIGHT CREWMEMBERS

PART 147—AVIATION MAINTENANCE TECHNICIAN SCHOOLS

Name, Operations, and Curriculum

The purpose of these amendments to Part 147 of the Federal Aviation Regulations is to change the name of mechanic schools certificated under that part to "aviation maintenance technician schools"; provide more specific guidelines for the certification and operations of these schools; and provide new minimum curriculum requirements, for both certification and operations purposes, that reflect technological advancements of the aviation industry. The amendments to Part 65 reflect the changed name of the schools, and remove inconsistent or obsolete provisions.

Interested persons have been afforded an opportunity to participate in the making of these amendments by a notice of proposed rule making (Notice 69-6) issued on February 26, 1969, and published in the FEDERAL REGISTER on March 4, 1969 (34 F.R. 3751). Due consideration has been given to all comments presented in response to that notice.

Fifty-nine comments were received on the notice, the majority of which favored the proposals. A number of the comments either objected to particular items proposed, or suggested alternatives.

(1) *Change in name.* As proposed in the notice, these amendments substitute the designation "aviation maintenance technician school" for "mechanic school" in the title and text of Part 147. Most of the commentators favored this change of name, stating that it will reflect a

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/35 F.R. 5531/ on April 3, 1970)

more professional image and be more descriptive of the mechanic's job in today's advanced technology. One commentator proposed adding the phrase "FAA approved course" to distinguish this course from nonapproved courses. However, this change is considered to be unnecessary.

(2) *More specific guidelines for certification and operations of schools*—(a) *As to certification.* Two commentators opposed eliminating the requirement for test clubs for running-in engines, in § 147.15, asserting that test clubs are required to properly perform certain engine maintenance testing functions. The reason given in the notice for the proposed rule change is that current engine manufacturers' overhaul procedures do not require using test clubs for running-in engines after overhaul. It was not intended to preclude the use of test clubs in properly performing engine maintenance testing functions. However, to avoid possible confusion and accommodate the use of test clubs, where related to schools' specific curriculum in use, the term "suitable facilities for running engines" is substituted in these amendments for the proposed requirement of "separate space with permanent, portable, or mobile test stands."

Four commentators disapproved of the use of the word "suitable" (proposed for use in additional paragraphs of § 147.-15), asserting that the word lacks specificity and therefore is subject to a wide range of individual interpretations. The term "suitable" has previously appeared in six paragraphs of this section. As issued, the notice merely proposed application of this flexibility to the other requirements for facilities and equipment.

One commentator stated that the proposed changes do not place enough emphasis on the regulation of the classroom noise level. The noise level problem is met by the new requirement for an enclosed separate classroom suitable for teaching theory classes. Two commentators stated that the proposed changes should allow for provision of a space consisting of a classroom and a laboratory. However, to have laboratory and classroom space together would not improve the capability for noise control at the classroom level.

A number of comments were directed to the proposal that under § 147.23 a school must provide at least one instructor, holding appropriate mechanic certificates and ratings, for each 25 students in each shop or laboratory class. Thus, one commentator suggested that the ratio be no more than 20 students to one instructor in theory classes and 12 students to one instructor in shop and laboratory classes, asserting that a ratio of 25 students to one instructor in a shop or laboratory class is too many students for the instructor to control. On the other hand, several commentators opposed any limitation of this kind, characterizing it as too restrictive. The decision to have a specified ratio of students to instructors resulted from research and study, as well as from practical experience. The 25 to 1 ratio represents an upper limit, and it is not meant to suggest an ideal ratio. In fact, some schools normally employ ratios ranging from 20 to 1 down to 12 to 1.

(b) *As to operations.* Most of the commentators agreed with the proposed amendments to § 147.31 providing that a school may not credit a student with training received at that school prior to certification, and that a student may receive credit for previous experience to the extent that the experience is comparable to the required curriculum subjects. A few comments disagreed. However, as stated in the notice, this amendment should encourage schools to seek certification without delay.

A large number of commentators favored the proposed Admendment to § 147.31 requiring schools to use an approved system for determining final course grades, and for recording and controlling student attendance. Some commentators expressed concern that the FAA standard of acceptability might not be standard among all inspectors; or that it is difficult to have a rigid accounting of student class attendance at a collegiate-type school. The proposed changes, requiring only that each school establish an approved system that is capable of controlling and recording attendance, without complete standardization, is considered sufficient to assure uniformity, as stated in the notice.

A number of comments concerned the proposal to add to § 147.31 a provision that a school may not allow a student to attend classes of instruction more than 8 hours in any day or more than 6 days or 40 hours in any 7-day period. Several commentators asserted that this provision would prevent the student from attending make-up sessions, and other comments asserted that it would be desirable to allow the schools to give instruction for 48 hours in any 7-day period, as many students do not work and can carry the load. Other commentators suggested that the only limitation on student attendance should be the student's ability to maintain a 70-percent grade in all required subjects, or that students should not be allowed to receive course credit for attendance at courses other than during regularly scheduled hours of instruction, or that it should be possible to make up absences occurring because of sickness, strikes, holidays, and snow days. After further consideration, and in view of the comments and the fact that the schools may not require a student to attend classes of instruction for more than a specified number of hours, it has been determined not to implement this proposal.

Three commentators on the proposal to strike from § 147.35 the present requirement that the certificate issued (whether a certificate of completion or graduation) show the student's average grades, but to provide that the certificate reflect the student's standards of performance during the entire curriculum, asserted that such a showing is unnecessary since such a record is available from other sources. After further consideration and in view of these comments, it has been determined not to require the certificate to show either the average grades or standard of performance.

(3) *Minimum curriculum requirements.* The majority of the commentators agreed with the proposal, by amendment to § 147.21 and addition of appendices, to increase the number and type of items and subjects taught, and to indicate the levels of proficiency at which the items of subjects must be taught. Several comments questioned whether the general curriculum subjects must be taught as a separate curriculum from the airframe and powerplant curriculum subjects. This is not intended. The purpose of listing the general curriculum subjects separately is merely to avoid repetition.

A number of commentators opposed increasing the required numbers of hours of instruction. Principal comments stated that postgraduate high schools, technical institutes, and community colleges that operate on a 2-year curriculum would have problems with the increase in curriculum hours; and that the requirement that the curriculum show the required practical projects to be completed will be hard to enforce, and that it is impractical to list required projects for each school because of the changing nature of the aeronautical industry and the equipment involved.

As stated in the notice, a national study of the aviation mechanics occupations was used as the basis for developing these curriculums. Approximately 507 tasks commonly performed by mechanics were analyzed along with the results of a survey. The information collected showed the proportion of over 18,000 certificated mechanics who performed each task, the frequency with which the task was performed, and the degree of industry training involved. A National Advisory Committee, consisting of 15 members representing a broad segment of the aviation community, assisted in determining the tasks to be performed and the level of proficiency required of a student at a certificated school.

After careful review of all these suggestions, Appendix A is adopted as proposed. Appendix B is adopted with a change under the subject "Basic Electricity" that strikes out the words "conductivity and," so that the sentence reads "calculate and measure electrical power." Appendix C is adopted with the following changes: Item 36 is redesignated as Item 37 and the teaching level is raised to level 2, Item 37 is redesignated as Item 36 and the teaching level remains at level 1. Appendix D is adopted with one change: The teaching level of Item 1 is changed from level 2 to level 1.

The notice proposed that each school have a maximum of 2 years from the effective date of these amendments to change to the new curriculum. Two commentators felt that a 2-year period would be inadequate for a school to decide whether it desires to retain its certification, and suggested a 5-year period. However, the 2-year period is considered a sufficiently long period for the purpose.

The amendments to Part 65 remove obsolete or inconsistent provisions. These amendments are minor in nature, effect no substantive change and are ones in

which the public is not particularly interested. Notice and public procedure thereon are therefore unnecessary. The words "certificated mechanic school" are changed to "aviation maintenance technician school" in §§ 65.77 and 65.80, to conform with the new name in Part 147. In addition, these amendments add the words "or a certificate of completion" after the words "graduation certificate" in § 65.77 to conform with the change in Part 147. Also, the words "final phase of his training in the course curriculum" in § 65.80 are changed to "final subjects of his training in the approved curriculum" to conform with the change in Part 147.

In consideration of the foregoing, Parts 65 and 147 of the Federal Aviation Regulations are amended, effective May 3, 1970, as follows:

1. By amending Part 65 as follows:

a. By amending the introductory language in § 65.77 to read as follows:

§ 65.77 Experience requirements.

Each applicant for a mechanic certificate or rating must present either an appropriate graduation certificate or certificate of completion from a certificated aviation maintenance technician school or documentary evidence, satisfactory to the Administrator, of—

* * * * *

b. By amending § 65.80 to read as follows:

§ 65.80 Certificated aviation maintenance technician school students.

Whenever an aviation maintenance technician school certificated under Part 147 of this chapter shows to an FAA inspector that any of its students has made satisfactory progress at the school and is prepared to take the oral and practical tests prescribed by § 65.79, that student may take those tests during the final subjects of his training in the approved curriculum, before he meets the applicable experience requirements of § 65.77 and before he passes each section of the written test prescribed by § 65.75.

2. By amending Part 147 as follows:

a. By amending the Part heading to read as set forth above.

b. By striking out the words "mechanic school" wherever they appear, and inserting the words "aviation maintenance technician school" in place thereof.

c. By amending § 147.3, redesignating the present text as paragraph (a) and adding a new paragraph (b) to read as follows:

§ 147.3 Certificate required.

* * * * *

(b) After May 2, 1970, each person holding a valid mechanic school certificate shall be considered to hold an aviation maintenance technician school certificate.

d. By inserting the following new paragraph (c) in § 147.7:

§ 147.7 Duration of certificates.

* * * * *

(c) Each holder of an aviation maintenance technician school certificate issued before May 3, 1970, may, before May 3, 1972, change his approved curriculum to conform with § 147.21 and have it approved. If the holder does not sooner apply for approval, his certificate expires on the latter date.

e. By amending § 147.15 to read as follows:

§ 147.15 Space requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have such of the following properly heated, lighted, and ventilated facilities as are appropriate to the rating he seeks and as the Administrator determines are appropriate for the maximum number of students expected to be taught at any time:

(a) An enclosed classroom, separate from other space and facilities, suitable for teaching theory classes.

(b) Suitable facilities, either central or located in training areas, arranged to assure proper separation from the working space for the segregation and protection of parts, tools, materials, and similar articles.

(c) Suitable separate space for doping and paint spraying.

(d) Suitable separate space equipped with washtank and degreasing equipment with air pressure, or other adequate cleaning equipment.

(e) Suitable facilities for running engines.

(f) Suitable separate space, with adequate equipment, including benches, tables, and instruments, to disassemble, repair, assemble, test, service, and inspect—

(1) Ignition, electrical equipment, and appliances;

(2) Carburetors and fuel systems; and

(3) Hydraulic and vacuum systems for aircraft, aircraft engines, and their appliances.

(g) Suitable space, with adequate equipment including tables, benches, horses, stands, and jacks, for disassembling, inspecting, and rigging aircraft.

(h) Suitable space, with adequate equipment, for disassembling, inspecting, overhauling, assembling, troubleshooting, and timing engines.

f. By amending paragraph (a)(1) of § 147.17 to read as follows:

§ 147.17 Instructional equipment requirements.

(a) * * *

(1) Various kinds of airframe structures, airframe systems and components, powerplants, and powerplant systems and components (including propellers), of a quantity and type suitable to complete the practical projects required by its approved curriculums.

* * * * *

g. By amending paragraphs (b), (c), (d), and (e) of § 147.21 to read as follows:

§ 147.21 General curriculum requirements.

* * * * *

(b) The curriculum must offer at least the following number of hours of instruction for the rating shown:

(1) Airframe—1,150 hours (400 general plus 750 airframe).

(2) Powerplant—1,150 hours (400 general plus 750 powerplant).

(3) Combined airframe and powerplant—1,900 hours (400 general plus 750 airframe and 750 powerplant).

(c) The curriculum must cover the subjects and items prescribed in Appendix B, and in Appendix C or D as applicable. Each item must be taught at the indicated level of proficiency, as defined in Appendix A.

(d) The curriculum must show—

(1) The required practical projects to be completed;

(2) For each subject, the proportions of theory and other instruction to be given; and

(3) A schedule of the required school tests to be given.

(e) The curriculum must be so designed that at least 50 percent of the total curriculum time is spent in shop and laboratory instruction.

h. By amending § 147.23 to read as follows:

§ 147.23 Instructor requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must provide the number of instructors holding appropriate mechanic certificates and ratings that the Administrator determines necessary to provide adequate instruction and supervision of the students, including at least one such instructor for each 25 students in each shop or laboratory class. However, the applicant may provide specialized instructors, who are not certificated mechanics, to teach only mathematics, physics, drawing, and similar subjects.

i. By amending § 147.31 to read as follows:

§ 147.31 Attendance and enrollment, tests, and credit for prior instruction or experience.

(a) A certificated aviation maintenance technician school may not require any student to attend classes of instruction more than 8 hours in any day or more than 6 days or 40 hours in any 7-day period.

(b) Each school shall give an appropriate test to each student who completes a subject at that school.

(c) A school may not graduate a student unless he has completed all of the appropriate curriculum requirements. However, the school may credit a student with instruction or previous experience as follows:

(1) A school may credit a student with instruction he has satisfactorily completed at an accredited college, State-owned vocational or trade school, or military technical specialty school, or at an aviation maintenance technician school other than the crediting school before the latter was certificated. It may determine the amount of credit to be allowed by giving the applicant an entrance test equal to the one given to students who complete a comparable required curriculum subject at the school, or by an authenticated transcript of his grades from his former school, showing

the curriculum in which he was enrolled, the hours of attendance, and his grades in each subject. However, in the case of an applicant with military technical specialty training, it may determine the amount of credit only on the basis of an entrance test.

(2) A school may credit a student with previous mechanic experience comparable to required curriculum subjects. It must determine the amount of credit to be allowed by documents verifying that experience, and by giving the student a test equal to the one given to students who complete the comparable required curriculum subject at the school.

(d) A school may not have more students enrolled than the number stated in its application for a certificate, unless it amends its application and has it approved.

(e) A school shall use an approved system for determining final course grades, and for recording and controlling student attendance. The system must show hours of absence allowed, and makeup provisions for classes missed.

j. By striking out the words "phase of his course" in paragraph (b) of § 147.33 and inserting the word "subject" in place thereof, and by amending paragraph (a)(1) of that section to read as follows:

§ 147.33 Records.

(a) * * *

(1) His attendance, tests, and grades received on the subjects required by this part;

* * * * *

k. By striking out the words "and courses" wherever they appear in the third sentence of paragraph (a) of § 147.35, and by amending paragraph (b) of that section to read as follows:

§ 147.35 Transcripts and graduation certificates.

* * * * *

(b) Each school shall give a graduation certificate or certificate of completion to each student that it graduates. An official of the school shall authenticate the certificate. The certificate must show the date of graduation and the approved curriculum title.

l. By inserting the following new § 147.36:

§ 147.36 Maintenance of instructor requirements.

Each certificated aviation maintenance technician school shall, after certification or addition of a rating, continue to provide the number of instructors holding appropriate mechanic certificates and ratings that the Administrator determines necessary to provide adequate instruction and supervision of the students, including at least one such instructor for each 25 students in each shop or laboratory class. The school may continue to provide specialized instructors, who are not certificated mechanics, to teach only mathematics, physics, drawing, and similar subjects.

m. By inserting the following new §§ 147.38 and 147.38a:

§ 147.38 Maintenance of curriculum requirements.

(a) Each certificated aviation maintenance technician school shall adhere to its approved curriculum.

(b) A school may not change its approved curriculum unless the change is approved in advance.

§ 147.38a Quality of instruction.

Each certificated aviation maintenance technician school shall provide instruction of such quality that, of its graduates of a curriculum for each rating who apply for a mechanic certificate or additional rating within 60 days after they are graduated, the percentage of those passing the applicable FAA written test on their first attempt during any period of 24 calendar months is at least the percentage figured as follows:

(a) For a school graduating fewer than 51 students during that period—the national passing norm minus the number 20.

(b) For a school graduating at least 51, but fewer than 201, students during that period—the national passing norm minus the number 15.

(c) For a school graduating more than 200 students during that period—the national passing norm minus the number 10.

As used in this section, "national passing norm" is the number representing the percentage of all graduates (of a curriculum for a particular rating) of all certificated aviation maintenance technician schools who apply for a mechanic certificate or additional rating within 60 days after they are graduated and pass the applicable FAA written test on their first attempt during the period of 24 calendar months described in this section.

n. By inserting new Appendices A, B, C, and D after § 147.45, to read as follows:

APPENDIX A—CURRICULUM REQUIREMENTS

This appendix defines terms used in Appendices B, C, and D of this part, and describes the levels of proficiency at which items under each subject in each curriculum must be taught, as outlined in Appendices B, C, and D.

(a) *Definitions.* As used in Appendices B, C, and D:

(1) "Inspect" means to examine by sight and touch.

(2) "Check" means to verify proper operation.

(3) "Troubleshoot" means to analyze and identify malfunctions.

(4) "Service" means to perform functions that assure continued operation.

(5) "Repair" means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.

(6) "Overhaul" means to disassemble, inspect, repair as necessary, and check.

(b) *Teaching levels.*

(1) Level 1 requires:

(i) Knowledge of general principles, but no practical application.

(ii) No development of manipulative skill.

(iii) Instruction by lecture, demonstration, and discussion.

(2) Level 2 requires:

(i) Knowledge of general principles, and limited practical application.

(ii) Development of sufficient manipulative skill to perform basic operations.

(iii) Instruction by lecture, demonstration, discussion, and limited practical application.

(3) Level 3 requires:

(i) Knowledge of general principles, and performance of a high degree of practical application.

(ii) Development of sufficient manipulative skill to accomplish return to service.

(iii) Instruction by lecture, demonstration, discussion, and a high degree of practical application.

APPENDIX B—GENERAL CURRICULUM SUBJECTS

This appendix lists the subjects required in at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

A. BASIC ELECTRICITY

Teaching level	
(1)	1. Measure capacitance and inductance.
(2)	2. Calculate and measure electrical power.
(3)	3. Measure voltage, current, resistance, continuity, and leakage.
(3)	4. Determine the relationship of voltage, current, and resistance in electrical circuits.
(3)	5. Read and interpret electrical circuit diagrams.
(3)	6. Inspect and service batteries.

B. AIRCRAFT DRAWINGS

(2)	7. Use drawings, symbols, and schematic diagrams.
(3)	8. Draw sketches of repairs and alterations.
(3)	9. Use blueprint information.
(3)	10. Use graphs and charts.

C. WEIGHT AND BALANCE

(2)	11. Weigh aircraft.
(3)	12. Perform complete weight-and-balance check and record data.

D. FLUID LINES AND FITTINGS

(3)	13. Fabricate and install rigid and flexible fluid lines and fittings.

E. MATERIALS AND PROCESSES

(1)	14. Identify and select appropriate nondestructive testing methods.
(2)	15. Perform penetrant, chemical etching, and magnetic particle inspections.
(2)	16. Perform basic heat-treating processes.
(3)	17. Identify and select aircraft hardware and materials.
(3)	18. Inspect and check welds.
(3)	19. Perform precision measurements.

F. GROUND OPERATION AND SERVICING

(2)	20. Start, ground operate, move, service, and secure aircraft.
(2)	21. Identify and select fuels.

G. CLEANING AND CORROSION CONTROL

(3)	22. Identify and select cleaning materials.
(3)	23. Perform aircraft cleaning and corrosion control.

Teaching level

H. MATHEMATICS

(1) 24. Extract roots and raise numbers to a given power.
(2) 25. Determine areas and volumes of various geometrical shapes.
(3) 26. Solve ratio, proportion, and percentage problems.
(3) 27. Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.

I. MAINTENANCE FORMS AND RECORDS

(3) 28. Write descriptions of aircraft condition and work performed.
(3) 29. Complete required maintenance forms, records, and inspection reports.

J. BASIC PHYSICS

(2) 30. Use the principles of simple machines; sound, fluid, and heat dynamics.

K. MAINTENANCE PUBLICATIONS

(3) 31. Select and use FAA and manufacturer's aircraft maintenance specifications, data sheets, manuals, and publications, and related Federal Aviation Regulations.
(3) 32. Read technical data.

L. MECHANIC PRIVILEGES AND LIMITATIONS

(3) 33. Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.

APPENDIX C—AIRFRAME CURRICULUM SUBJECTS

This appendix lists the subjects required in at least 750 hours of each airframe curriculum, in addition to at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. AIRFRAME STRUCTURES

A. WOOD STRUCTURES

(1) 1. Service and repair wood structures.
(2) 2. Identify wood defects.
(2) 3. Inspect wood structures.

B. AIRCRAFT COVERING

(1) 4. Select and apply fabric and fiberglass covering materials.
(3) 5. Inspect, test, and repair fabric and fiberglass.

C. AIRCRAFT FINISHES

(1) 6. Apply trim, letters, and touch-up paint.
(2) 7. Identify and select aircraft finishing materials.
(2) 8. Apply paint and dope.
(2) 9. Inspect finishes and identify defects.

D. SHEET METAL STRUCTURES

(2) 10. Install special rivets and fasteners.
(2) 11. Inspect bonded structures.
(2) 12. Inspect and repair plastics, honeycomb, and laminated structures.
(2) 13. Inspect, check, service, and repair windows, doors, and interior furnishings.
(3) 14. Inspect and repair sheet-metal structures.
(3) 15. Install conventional rivets.
(3) 16. Hand form, lay out, and bend sheet metal.

E. WELDING

(1) 17. Weld magnesium and titanium.
(1) 18. Solder stainless steel.
(1) 19. Fabricate tubular structures.
(2) 20. Solder, braze, gas-weld, and arc-weld steel.
(2) 21. Weld aluminum and stainless steel.

F. ASSEMBLY AND RIGGING

(1) 22. Rig rotary-wing aircraft.
(2) 23. Rig fixed-wing aircraft.
(2) 24. Check alignment of structures.
(3) 25. Assemble aircraft.
(3) 26. Balance and rig movable surfaces.
(3) 27. Jack aircraft.

G. AIRFRAME INSPECTION

(3) 28. Perform airframe conformity and airworthiness inspections.

II. AIRFRAME SYSTEMS AND COMPONENTS

A. AIRCRAFT LANDING GEAR SYSTEMS

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

B. HYDRAULIC AND PNEUMATIC POWER SYSTEMS

(2) 30. Repair hydraulic and pneumatic power systems components.
(3) 31. Identify and select hydraulic fluids.
(3) 32. Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.

C. CABIN ATMOSPHERE CONTROL SYSTEMS

(1) 33. Repair heating, cooling, air-conditioning, pressurization, and oxygen system components.
(1) 34. Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization systems.
(2) 35. Inspect, check, troubleshoot, service and repair oxygen systems.

D. AIRCRAFT INSTRUMENT SYSTEMS

(1) 36. Inspect, check, service, troubleshoot and repair heading, speed, altitude, time, attitude, temperature, pressure and position indicating systems.
(2) 37. Install instruments.

E. COMMUNICATION AND NAVIGATION SYSTEMS

(1) 38. Inspect, check, and service auto-pilot and approach control systems.
(1) 39. Inspect, check, and service aircraft electronic communication and navigation systems.
(2) 40. Inspect and repair antenna and electronic equipment installations.

F. AIRCRAFT FUEL SYSTEMS

(1) 41. Check and service fuel dump systems.
(1) 42. Perform fuel management, transfer, and defueling.
(1) 43. Inspect, check, and repair pressure fueling systems.
(2) 44. Repair aircraft fuel system components.
(2) 45. Inspect and repair fluid quantity indicating systems.
(2) 46. Troubleshoot, service, and repair fluid pressure and temperature warning systems.
(3) 47. Inspect, check, service, troubleshoot, and repair aircraft fuel systems.

G. AIRCRAFT ELECTRICAL SYSTEMS

(2) 48. Repair aircraft electrical system components.
(3) 49. Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.
(3) 50. Inspect, check, troubleshoot, service, and repair alternating current and direct current electrical systems.

H. POSITION AND WARNING SYSTEMS

(1) 51. Inspect, check, and service speed- and takeoff-warning systems, electrical brake controls, and antiskid systems.
(3) 52. Inspect, check, troubleshoot, service, and repair landing gear position indicating and warning systems.

I. ICE AND RAIN CONTROL SYSTEMS

(2) 53. Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.

J. FIRE PROTECTION SYSTEMS

(1) 54. Inspect, check, and service smoke and carbon monoxide detection systems.
(3) 55. Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.

APPENDIX D—POWERPLANT CURRICULUM SUBJECTS

This appendix lists the subjects required in at least 750 hours of each powerplant curriculum, in addition to at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. POWERPLANT THEORY AND MAINTENANCE

A. RECIPROCATING ENGINES

(1) 1. Inspect and repair 14-cylinder or larger radial engine.
(2) 2. Overhaul reciprocating engine.
(3) 3. Inspect, check, service, and repair opposed and radial engines and reciprocating engine installations.
(3) 4. Install, troubleshoot, and remove reciprocating engines.

B. TURBINE ENGINES

(2) 5. Overhaul turbine engine.
(2) 6. Inspect, check, service, and repair turbine engines and turbine engine installations.
(2) 7. Install, troubleshoot, and remove turbine engines.

C. ENGINE INSPECTION

(3) 8. Perform powerplant conformity and air worthiness inspections.

II. POWERPLANT SYSTEMS AND COMPONENTS

A. ENGINE INSTRUMENT SYSTEMS

(2) 9. Troubleshoot, service, and repair fluid rate-of-flow indicating systems.

Teaching level	
(3)	10. Inspect, check, service, troubleshoot, and repair engine temperature, pressure, and r.p.m. indicating systems.

B. ENGINE FIRE PROTECTION SYSTEMS

(3)	11. Inspect, check, service, troubleshoot, and repair engine fire detection and extinguishing systems.

C. ENGINE ELECTRICAL SYSTEMS

(2)	12. Repair engine electrical system components.
(3)	13. Install, check, and service engine electrical wiring, controls, switches, indicators, and protective devices.

D. LUBRICATION SYSTEMS

(2)	14. Identify and select lubricants.
(2)	15. Repair engine lubrication system components.
(3)	16. Inspect, check, service, troubleshoot, and repair engine lubrication systems.

E. IGNITION SYSTEMS

(2)	17. Overhaul magneto and ignition harness.
(2)	18. Repair engine ignition system components.
(3)	19. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine ignition systems.

F. FUEL METERING SYSTEMS

(1)	20. Inspect, check, and service water injection systems.
(2)	21. Overhaul carburetor.
(2)	22. Repair engine fuel metering system components.
(3)	23. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.

G. ENGINE FUEL SYSTEMS

(2)	24. Repair engine fuel system components.
(3)	25. Inspect, check, service, troubleshoot, and repair engine fuel systems.

H. INDUCTION SYSTEMS

(2)	26. Inspect, check, troubleshoot, service, and repair engine ice and rain control systems.
(2)	27. Inspect, check, service, and repair heat exchangers and superchargers.
(3)	28. Inspect, check, service, and repair carburetor air intake and induction manifolds.

I. ENGINE COOLING SYSTEMS

(2)	29. Repair engine cooling system components.
(3)	30. Inspect, check, troubleshoot, service, and repair engine cooling systems.

J. ENGINE EXHAUST SYSTEMS

(2)	31. Repair engine exhaust system components.
(3)	32. Inspect, check, troubleshoot, service, and repair engine exhaust systems.

K. PROPELLERS

(1)	33. Inspect, check, service, and repair propeller synchronizing and ice control systems.
(2)	34. Identify and select propeller lubricants.
(2)	35. Balance propellers.
(2)	36. Repair propeller control system components.
(3)	37. Inspect, check, service, and repair fixed-pitch, constant-speed, and feathering propellers, and propeller governing systems.
(3)	38. Install, troubleshoot, and remove propellers.

(Secs. 313(a), 601, 607, Federal Aviation Act of 1958; 49 U.S.C. 1354(a), 1421, 1427; sec. 6(c) of the Department of Transportation Act; 49 U.S.C. 1655(c))

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J. H. SHAFFER,
Administrator.