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ADVISORY CIRCULAR

AIRFRAME AND POWERPLANT MECHANICS EXAMINATION GUIDE

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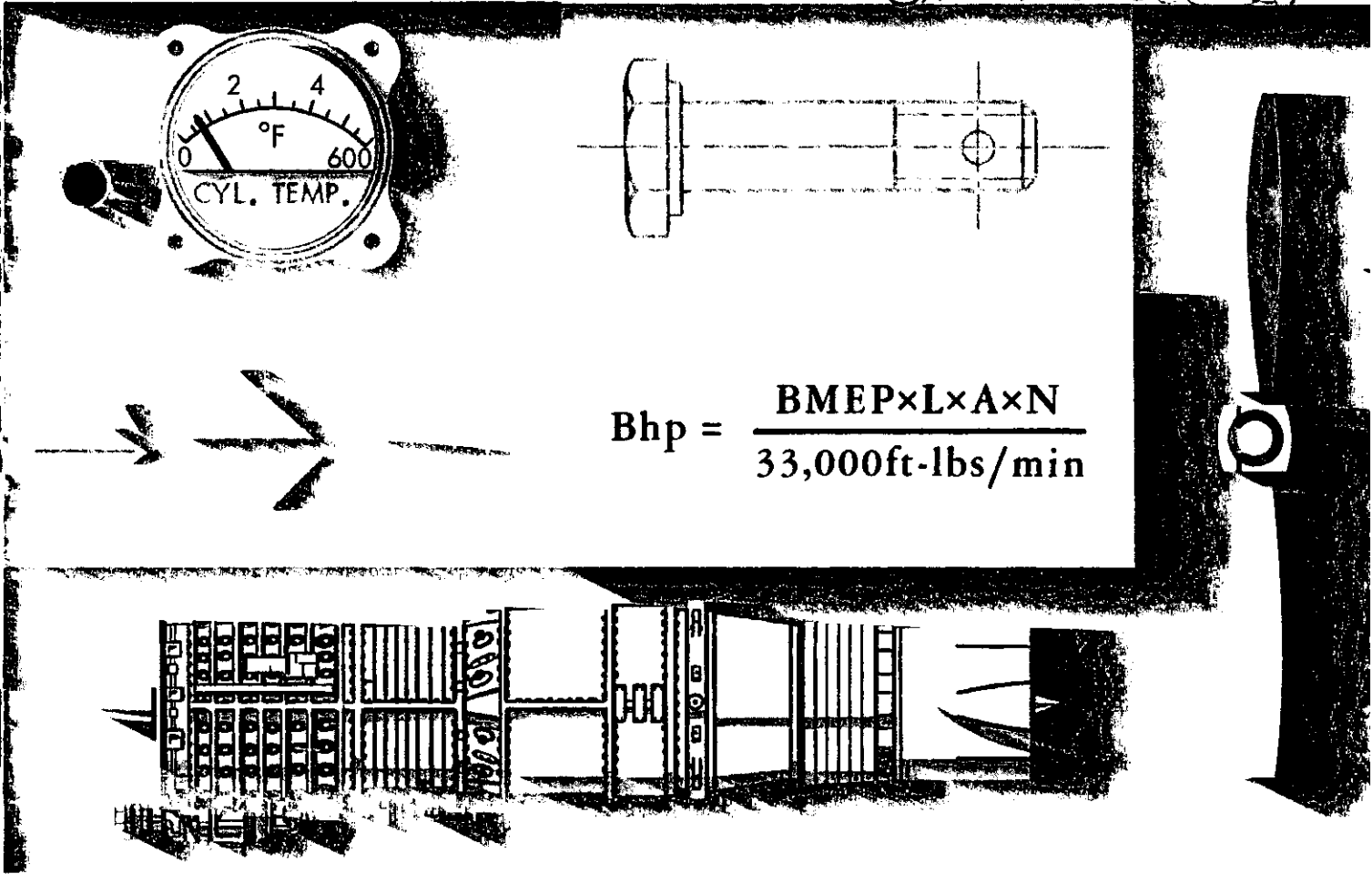

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Federal Aviation Agency

ADVISORY CIRCULAR

AC NO: AC 65-2 AIRMEN	
EFFECTIVE: 7/22/63	

SUBJECT: AIRFRAME AND POWERPLANT MECHANICS EXAMINATION STUDY GUIDE

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1. PURPOSE. This circular announces the availability to the public of a revised Airframe and Powerplant Mechanics Examination Study Guide.

2. DESCRIPTION OF THE PUBLICATION. This study guide provides information to prospective airframe and powerplant mechanics, and other persons interested in Federal Aviation Agency certification of aviation mechanics, about mechanic certificate requirements, application for a certificate or rating, and mechanic examinations. It guides prospective applicants toward a clear understanding of the requirements, reference material, examinations, and the application and examining procedures.

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George S. Moore
Director
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AIRFRAME AND POWERPLANT MECHANICS EXAMINATION GUIDE

Revised
1963

FEDERAL AVIATION AGENCY
Flight Standards Service

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PREFACE

The Maintenance Division of Flight Standards Service, Federal Aviation Agency, has issued this Airframe and Powerplant Mechanics Examination Guide, AC No. 65-2, to provide information to prospective airframe and powerplant mechanics and other persons interested in Federal Aviation Agency certification of aviation mechanics. It contains information about mechanic certificate requirements, application for a certificate or rating, and mechanic examinations. Its purpose is to guide prospective applicants toward a clear understanding of the requirements, reference material, examinations, and the application and examining procedures.

This guide supersedes the Airframe and Powerplant Mechanics Examination Guide dated June 1958.

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INTRODUCTION

Certificated aviation mechanics, in the United States, are private individuals who are given privileges in connection with the maintenance of civil aircraft by reason of having shown that they are qualified to assume the responsibility of the privileges. The requirements for a mechanic certificate and ratings, and the privileges and limitations of a mechanic certificate holder, are prescribed in Federal Aviation Regulation Part 65—Certification: Airmen Other Than Flight Crewmembers (New). Any person who meets the requirements is entitled to a mechanic certificate. Application is made on a form and in the manner prescribed.

Briefly, the requirements are concerned with age, language ability, experience, knowledge, and skill. The sections of this guide explain each requirement and the procedure for either substantiating or demonstrating that each has been met.

The sections dealing with the written examination (to demonstrate knowledge) and the oral and practical examinations (to demonstrate skill) describe the type of tests used and what they contain. The examination subject listing and the sample questions and projects should be helpful during preparation for examination.

The FAA Regions listed in the Appendix are divided into a number of districts, each of which covers a limited geographical area. Most of the FAA contacts an applicant or a mechanic certificate holder has are with the district office that serves his area.

MECHANIC CERTIFICATE ELIGIBILITY

Mechanic certificate requirements can be classified as general certificate requirements, experience requirements, knowledge requirements, and skill requirements. This section deals mainly with the general certificate requirements and experience requirements. Other sections of the manual discuss knowledge and skill requirements separately.

GENERAL REQUIREMENTS

Age.—A person must be at least 18 years of age to be issued a mechanic certificate. An applicant who meets all the requirements except age may apply for a certificate and complete all of the required tests, but a mechanic certificate cannot be issued to him until he reaches his 18th birthday.

Language.—An applicant must be able to read, write, speak, and understand the English language. Some exception can be made in the case of certain mechanics working outside the United States.

Tests.—All of the tests prescribed by Federal Aviation Regulations must be passed within a period of 24 months. A written, an oral, and a practical examination are required for each rating.

Ratings.—The Federal Aviation Regulations provide for two mechanic ratings: airframe and powerplant. The requirements for at least one rating must be met to be eligible for a mechanic certificate. An applicant for a mechanic certificate or a certificated mechanic applying for an additional rating must meet the experience, knowledge, and skill requirements for the rating being sought and pass all of the tests prescribed for that rating within a period of 24 months.

EXPERIENCE REQUIREMENTS

Each applicant for a mechanic certificate or rating must present evidence that he meets the experience requirements for the rating sought. Experience can be gained by attending an FAA certificated mechanic school or by performing, for a specified period of time, the duties appropriate to the rating.

Certificated mechanic schools offer courses that provide experience appropriate to either or both ratings. Schools are certificated on the basis of being able to furnish the required experience through formally established and approved courses. A graduation certificate indicating successful completion of the appropriate course of a certificated mechanic school is satisfactory evidence that the experience requirements have been met.

Applicants who have had 18 months of practical experience performing the duties appropriate to either rating meet the experience requirements for that rating. The duties appropriate to a rating consist of experience with the procedures, practices, materials, tools, machine tools, and equipment generally used in constructing, maintaining, or altering airframes, powerplants, or both, whichever is appropriate. A person applying for both ratings on the basis of having concurrent practical experience appropriate to both ratings must have had 30 months of such concurrent experience.

Any recognized field of aviation involving the construction, maintenance, or alteration of airframes or powerplants offers possibilities for gaining the required mechanical experience. Experience should be gained by performing or assisting in the performance of the basic mechanic work involved in aircraft construction, maintenance, or alteration.

Substantiation of practical experience is accomplished by submitting documentary evidence that shows the amount and type of experience gained. Documentation must be presented to an FAA inspector or advisor before the required examinations are taken.

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KNOWLEDGE REQUIREMENTS

The Federal Aviation Regulations require each applicant for a mechanic certificate or additional rating to demonstrate that he meets the knowledge requirements by passing a written examination. The tests cover the construction and maintenance of aircraft appropriate to the rating; the Regulations pertaining to the certification of, and operating rules for mechanics; the applicable provisions of the Regulations that deal with maintenance, repair, and alteration of aircraft; and general operating rules. The section entitled "The Written Examination" contains additional details.

SKILL REQUIREMENTS

Skill requirements, like experience and knowledge, are related to the rating sought. The Federal Aviation Regulations require each applicant for a mechanic certificate or rating to pass an oral and a practical test for the rating he seeks. The tests cover the applicant's basic skill in performing practical projects in the same general subject areas covered by the written test for that rating. The section entitled "Oral and Practical Examinations" offers further details concerning these examinations.

THE WRITTEN EXAMINATION

Application for a written examination can be made at an FAA Flight Sandards district office. The address of the nearest office can usually be learned from local aviation interests or by writing to one of the Regional Offices listed in the appendix of this guide.

Written examinations are administered by, or under the supervision of, specifically designated FAA employees and usually can be taken only at district offices during normal working hours. If special conditions warrant, and prior arrangements are made, some offices give written examinations at other locations or during other than normal working hours.

Written examinations cannot be administered until the experience requirements have been met. Experience can usually be documented immediately prior to taking the written examination. An examination booklet and all the materials necessary to take the examination will be issued after eligibility has been established.

Most FAA district offices require that a firm appointment be made prior to the intended date of examination. An applicant is expected to appear at the place of examination early enough to be interviewed concerning his eligibility for written examination and to complete the examination within the normal working hours. The time allowed for written examinations is 5 hours for airframe, and 6 hours for powerplant.

The time allowed is sufficient to read, consider, and answer each question fully and carefully under normal circumstances. However, individual applicants will vary in the amount of time required to complete the examinations.

The examinations are made up of individual multiple-choice questions. Each question consists of two parts: the stem, which presents the problem, and a list of four possible answers. When reading the stem, be sure you understand the problem. Then consider each of the four choices for an answer or resolution to the problem. Only one of the choices will solve the problem fully and correctly. The tests do not contain questions designed to trick or mislead. If the intent of a question does not seem clear, the problem does not present itself fully, or the correct answer is difficult to select, continue with the examination and answer those questions which are less difficult. Then return to the more difficult or time-consuming questions.

The answer to each question must be marked on the special answer sheet which is provided. Mistakes are often made by transferring the selected answer to a column on the answer sheet that has a different number than the question being answered. Mistakes of this sort can be avoided by observing the number of the question being answered and the number of the answer column *each* time an answer is recorded.

After completion, the answer sheet will be forwarded by the district office to a central location for grading, scoring, reporting, and further processing. Grades on the examination will be reported to the applicant by mail. The address used for mailing will be that shown on the application portion of the answer sheet. Five working days (exclusive of time enroute in the mail) are normally required for answer sheets to be processed and grades reported.

The large volume of examinations handled by the FAA requires the use of mechanical and electrical devices in grading, processing, and reporting. These devices have proved to be highly reliable. However, to further insure fair grading, all machine-scored answer sheets that show grades below passing are hand-scored as a double check.

Grades are reported on the official Form FAA-578A entitled "Report of Airman Written Examination." It is the only acceptable

evidence of having passed the required written examination and must be presented later in the certification process. If the report is lost or destroyed, a duplicate copy can be obtained by sending $1 (money order or check made payable to FAA) to the Federal Aviation Agency, Airman Certification Branch, 5300 South Portland Avenue, Oklahoma City 19, Oklahoma, and stating the title of the examination, the place where it was taken, and the approximate date.

The minimum passing grade on FAA written examinations is 70 percent. A failed examination can be retaken after 30 days. If a separate grade is given for each section, only the failed section or sections will have to be retaken.

An alternate to the 30-day waiting period is to obtain additional instruction, as specified by Regulation, from a qualified person in the subjects failed. A certificated and appropriately rated mechanic or ground instructor, or a certificated repairman who is experienced in the subject failed, is considered qualified to give additional instruction to mechanic applicants.

If an examination is retaken in less than 30 days, a statement from the person who gave the required additional instruction must be presented. The statement must certify that he has given the applicant at least 5 hours of additional instruction in each of the subjects failed, and now considers him ready for retesting. The statement should be dated; should indicate the date or dates on which the instruction was given; should name the person who received the instruction; should identify, by name, the subject in which instruction was given; and should include the signature, type of certificate, certificate number, and ratings of the person who gave the instruction.

The subjects with which mechanic examinations are concerned are described on the following pages of this section. The subjects are arranged into three categories: (1) general, which relates to both airframe and powerplant ratings; (2) airframe, which relates to the airframe rating only; and (3) powerplant, which relates to the powerplant rating only.

Similar subject matter is grouped under descriptive headings or subject titles. Each subject title is followed by two parts. Part A describes the specific things an applicant should know about the subject; and Part B indicates the extent to which he should be concerned. An example is shown below with the parts identified.

Subject.—*Maintenance Forms and Records*

PART A—Understand the requirements for maintenance forms and records; their purpose and disposition.

PART B—Identify, complete, and make disposition of the forms and records required during the exercise of mechanic privileges.

PART A in the example indicates that the circumstances in which maintenance forms and records are required should be known; also, their purpose, what they contain, and what becomes of them after they are completed.

PART B of the example indicates how much an applicant should understand about the requirements, purpose, and disposition of maintenance forms and records. In this case it is to the extent that he can identify, complete, and make disposition of them. Part B of the example also indicates that he should concern himself only with those maintenance forms and records that are required during, or as a result of, the exercise of mechanic privileges.

Notice that neither Part A nor Part B of any item attempts to describe the privileges or duties of a certificated mechanic. Their only purpose is to help direct your study. In each case Part A shows what to study about each subject and Part B helps limit the subject matter.

One of the following sections in this guide contains sample written examination questions related to the subjects listed in this section. The sample examination is included only to show the type of questions used. No attempt has been made to cover any subject fully. Some of the questions actually appear on current examinations.

General Subjects

1. *Mechanic Privileges and Limitations.*—Understand the privileges and limitations of a mechanic certificate and rating, and the rules under which a mechanic must operate.

   Exercise mechanic privileges within the limitations and according to the operating rules prescribed by Regulation.

2. *Official FAA Publications.*—Understand the nature and purpose of the official publications that have a bearing on mechanic privileges and operating rules.

Identify and interpret the information contained in official publications concerning limitations, operating rules, standards, mandatory procedures, and precautions relating to the exercise of mechanic privileges.

3. *Maintenance Forms and Records.*—Understand the requirements for maintenance forms and records; their purpose and disposition.

Identify, complete, and make disposition of the forms and records required during the exercise of mechanic privileges.

4. *Basic Physics.*—Understand the basic physical principles that affect the operation or maintenance of aircraft.

Apply a knowledge of basic physics to aircraft operation and maintenance.

5. *Basic Mathematics.*—Understand the basic mathematical relationships necessary to maintain aircraft.

Perform the mathematical operations used to maintain and understand the mechanical operation of aircraft.

6. *Maintenance Publications.* — Understand the nature and purpose of maintenance publications that relate to specific aeronautical products or classes of aeronautical products.

Identify and use maintenance publications concerning the identification, operation, installation, or maintenance of specific aeronautical products.

7. *Mechanical Drawing.* — Understand the forms and symbols used to describe products, systems, and processes.

Interpret blueprints, drawings, and diagrams normally used in the symbolic or pictorial description of aeronautical products, systems, or processes.

8. *Aircraft Weight and Balance.*—Understand the requirements of, and the methods used to determine and control, aircraft weight and balance.

Make weight and balance determinations and control aircraft weight and balance.

9. *Basic Handtools and Measuring Devices.*—Understand the use and care of basic handtools, and the use, care, and interpretation of devices and instruments used to determine length, depth, diameter, angularity, etc.

Select, use, and care for the handtools and measuring devices necessary for aircraft maintenance.

10. *Basic Aerodynamics.*—Understand the basic principles of the motion of air and the forces acting on solid objects in motion relative to air.

Apply a knowledge of basic aerodynamics to aircraft principles of flight and the forces acting on an aircraft during flight.

11. *Nondestructive Testing.*—Understand the principles and limitations of the methods used to determine the physical condition of a part or material without damaging or destroying it.

Determine the appropriateness of common methods of nondestructive tests used in conjunction with aircraft and interpret the results of such tests.

12. *Basic Electricity.*—Understand the physical laws upon which the function of electrical circuits and devices is based and their electrical measurement requirements.

Apply a knowledge of basic electrical laws, principles, and relationships to the function and operation of aircraft electrical circuits and devices, and the use of electrical test instruments.

13. *Batteries.*—Understand the principles of electric storage cells; the construction features and maintenance requirements of storage batteries.

Select, install, service, and maintain aircraft storage batteries.

14. *Aircraft Maintenance Equipment, Techniques, and Practices.*—Understand the requirements for, and the use of, special aircraft maintenance equipment, techniques, and practices.

Determine when and in what manner special equipment, techniques, and practices must be utilized during the service, inspection, assembly, and handling of aircraft.

15. *Safety Practices.*—Understand the practices and precautions that are necessary to avoid injury to persons or damage to property.

Recognize the need for, and put into effect, safety practices during the maintenance and operation of aircraft.

16. *Inspection Procedures and Techniques.*—Understand the requirements that inspection procedures and techniques must meet in order to produce reliable inspection judgments.

Determine and utilize the procedures and techniques that are necessary to reach reliable inspection judgments.

17. *Fuels and Fuel Systems.*—Understand engine fuel requirements, fuel characteristics, identification and handling; the installation, maintenance, and operation requirements of fuel systems and fuel system components.

Identify, select, and handle aircraft fuels; and select, install, adjust, service, and maintain aircraft fuel systems.

Airframe Subjects

18. *Theory of Flight.*—Understand the principles of flight, control, and stability, and their relationship to aircraft operation and maintenance requirements.

Apply an understanding of the principles of flight, control, and stability to aircraft operation and maintenance requirements.

19. *Flight Control Systems.*—Understand the principles of operation and the maintenance requirements of aircraft flight control systems.

Install, adjust, service and maintain aircraft flight control systems.

20. *Cleaning and Preservation.*—Understand aircraft cleaning and preservation requirements and the materials, practices, and processes used to meet the requirements.

Select and use the materials, practices, and processes necessary to meet the aircraft cleaning and preservation requirements.

21. *Assembly and Rigging.*—Understand aircraft assembly and rigging requirements and procedures.

Apply the procedures necessary to meet the aircraft assembly and rigging requirements.

22. *Aircraft Finishes.*—Understand aircraft protective finish requirements, processes, and practices.

Select and apply organic finishes and determine that all types of finishes meet the aircraft protective finish requirements.

23. *Aircraft Covering.*—Understand aircraft nonstructural covering requirements, material requirements, material characteristics, application processes, and maintenance requirements.

Select, apply, service, and maintain aircraft nonstructural covers.

24. *Aircraft Structures.*—Understand aircraft basic structural design criteria, construction characteristics, and maintenance requirements.

Determine that the maintenance requirements are met in a manner to ensure that the structure continues to meet its design criteria.

25. *Structural Materials.* — Understand the identification features, physical characteristics, suitability, and limitations of structural materials and their preservation, storage, handling, and fabrication requirements.

Identify, select, and handle aircraft structural materials, and determine appropriate fabrication methods and processes.

26. *Procedures and Techniques.*—Understand the procedures and techniques necessary in the fabrication and maintenance of aircraft structures.

Lay out, machine, shape, and join structural materials used in the fabrication and maintenance of aircraft structures.

27. *Aircraft Hydraulic Systems.*—Understand the function and operation of aircraft hydraulic systems and their maintenance requirements.

Install, adjust, service, and maintain aircraft hydraulic systems.

28. *Hydraulic Fluids.*—Understand the characteristics of hydraulic fluids.

Select and handle hydraulic fluids.

29. *Hydraulic Pumps and Actuators.*—Understand the function, operation, and maintenance requirements of hydraulic pumps and actuators.

Select, install, adjust, and service hydraulic pumps and actuating devices.

30. *Hydraulic Pressure and Flow Control.*—Understand the principles of pressure and flow control, and the function, operation, and maintenance requirements of the valves and devices that control hydraulic pressure and flow.

Select, install, adjust, and service hydraulic pressure and flow control devices.

31. *Aircraft Landing Gear.*—Understand the function, operation, and maintenance requirements of aircraft landing gear and their associated assemblies.

Select, install, adjust, service, operate, and maintain aircraft landing gear and their associated assemblies.

32. *Aircraft Pneumatic Systems.*—Understand the principles of operation of aircraft pneumatic power systems.

Apply an understanding of pneumatic principles to normal and emergency aircraft pneumatic system operation.

33. *Aircraft Fire Detection and Control Systems.*—Understand the function, operation, and maintenance requirements of fire detection and control systems.

Select, install, adjust, and service aircraft fire detection and control systems.

34. *Cabin Atmosphere Control.*—Understand the principles of cabin atmosphere temperature, pressure, and contamination control.

Apply an understanding of atmosphere control principles to the operation and maintenance of aircraft cabin temperature, pressure, and contamination control systems.

35. *Aircraft Instrument Systems.*—Understand the purpose and principles of operation of aircraft instrument systems.

Select, install, and service the instrument systems associated with operation of the aircraft and its power systems.

36. *Airframe Ice Detection and Control Systems.*—Understand the function, operation, and maintenance requirements of ice detection and control systems.

Select, install, adjust, and service airframe ice detection and control systems.

37. *Aircraft Communication and Navigation Systems.*—Understand aircraft communication and navigation system installation and power requirements.

Determine that aircraft communication and navigation system installation and power requirements are met and maintained.

38. *Generators and Generator Control.*—Understand the principles, operation, physical characteristics, and maintenance requirements of generators, generator controls, and their control and power circuits.

Select, install, adjust, service, and maintain aircraft DC and AC generators, generator controls, and their control and power circuits.

39. *Motors and Motor Control.*—Understand the principles, operation, physical characteristics, and maintenance requirements of motors, motor controls, and their control and power circuits.

Select, install, adjust, service, and maintain aircraft motors, motor controls, and their control and power circuits.

40. *Aircraft Electrical Systems.*—Understand the function and operation of the aircraft electrical system, the function and purpose of its component parts, and its maintenance requirements.

Select, install, adjust, service, and maintain the aircraft electrical system and its component parts.

Powerplant Subjects

41. *Basic Carburetion.*—Understand the principles of carburetion, the engine's fuel/air requirements, and the function of the carburetor and the induction system in meeting these requirements.

Apply the basic carburetion principles to the engine's fuel/air requirements, carburetors, and induction systems.

42. *Induction Systems.*—Understand the function and operation of the induction system, the function and purpose of the component parts, and their maintenance requirements.

Install, service, and maintain aircraft engine induction systems and their component parts.

43. *Float-Type Carburetors.*—Understand the operating characteristics of float-type carburetors, how they function to meet the engine's fuel/air requirements, their construction features, and the systems common to float-type carburetors.

Select, install, adjust, service, and maintain float-type carburetors and their related parts.

44. *Pressure Carburetors.*—Understand the operating characteristics of pressure carburetors, how they function to meet the engine's fuel/air requirements, their construction features, and the systems common to pressure carburetors.

    Select, install, adjust, and service pressure carburetors and their related components.

45. *Direct Fuel Injection Systems.*—Understand the operating characteristics of direct fuel injection systems, how they function to meet the engine's fuel/air requirements, their construction features, and their related components.

    Select, install, adjust, and service direct fuel injection systems and their related components.

46. *Carburetor Systems.*—Understand the purpose, operating principles, and the effect on engine operation of carburetor systems such as accelerator, mixture control, power enrichment, anti-detonant injection, and idle speed and mixture control.

    Recognize proper and improper operation of the common carburetor systems and take corrective action when required.

47. *Turbine Fuel Control.*—Understand the basic gas turbine fuel control requirements and how they are met by the turbine fuel control unit.

    Select, install, and service turbine fuel control units.

48. *Superchargers and Impellers.*—Understand the purpose, operation, limitations, and the effect on engine operation of superchargers and impellers.

    Service, adjust, and detect malfunctions of superchargers and impellers.

49. *Basic Ignition.*—Understand the principles of engine ignition, the engine's ignition requirements, and the function of the ignition system in meeting these requirements.

    Apply the basic ignition principles to engine ignition requirements, ignition systems, and ignition system components.

50. *Magnetos.*—Understand the theory of operation and the characteristics of magnetos and their related parts.

    Select, install, adjust, service, and maintain the common types of magnetos and their related parts.

51. *Ignition Wiring.*—Understand the function and operation of the ignition wiring circuits and their installation, service, and maintenance requirements.

    Select, install, service, and maintain the ignition wiring circuits and the parts necessary for their installation, control, and operation.

52. *Turbine Ignition.*—Understand the principles of turbine engine ignition, turbine engine ignition requirements, and the function of the ignition system in meeting these requirements.

    Service, adjust, and detect malfunctions of turbine engine ignition systems.

53. *Spark Plugs and Igniters.*—Understand the engine's ignition spark requirements, the conditions under which spark plugs operate, and spark plug operational characteristics and constructional features.

    Select, install, service, handle, and analyze malfunctions of spark plugs and igniters.

54. *Starting Aids.*—Understand the purpose and operation of the starting aids associated with the ignition system.

    Select, install, service, and maintain the common types of starting aids associated with the ignition system.

55. *Basic Engine Principles.*—Understand the basic engine principles, physical characteristics, and maintenance and operating requirements.

    Apply the basic principles and knowledge of engine characteristics to the operating and maintenance requirements of reciprocating and turbine engines.

56. *Engine Operation.*—Understand the engine operating requirements, procedures, and indications of correct and incorrect operation.

    Operate the engine and determine whether the engine operating requirements are being met.

57. *Engine Installations.*—Understand aircraft engine installation requirements and how they are met.

Select, install, adjust, service, and maintain the parts and components used to install, attach, and control the engine.

58. *Engine Instruments.*—Understand the purpose and principles of operation of the instruments associated with aircraft engine operation.

Select, install, and service engine instrument systems.

59. *Exhaust Systems.*—Understand the function and operation of the engine exhaust system, the function and purpose of its component parts, and its maintenance requirements.

Install, service, and maintain the engine exhaust system.

60. *Cooling Systems.*—Understand the function and operation of the engine cooling system, the function and purpose of its component parts, and its maintenance requirements.

Install, service, and maintain the engine cooling system.

61. *Engine Maintenance Procedures and Techniques.*—Understand the engine's maintenance requirements and the procedures and techniques necessary to meet the requirements.

Determine and use the appropriate procedures and techniques to meet the engine's maintenance requirements.

62. *Basic Lubrication.*—Understand the basic principles of engine lubrication and the requirements and characteristics of lubricants.

Apply the basic engine lubrication principles and knowledge of lubricant requirements and characteristics to the operating and maintenance requirements of reciprocating and turbine engines.

63. *Lubrication Systems.* — Understand the function and operation of the engine lubrication system, the function and purpose of its component parts, and its maintenance requirements.

Install, service, and maintain aircraft engine lubrication systems and their component parts.

64. *Basic Propeller Principles.*—Understand the basic propeller principles, physical characteristics, and maintenance and operating requirements.

Apply the basic principles and knowledge of propeller characteristics to the operating and maintenance requirements of propellers.

65. *Propeller Operation.*—Understand the propeller operating requirements, procedures, and the indications of correct and incorrect operation.

Operate the propeller and determine whether the propeller operating requirements are being met.

66. *Propeller Installations.*—Understand propeller installation requirements and how they are met.

Select, install, adjust, service, and maintain the various parts and components used to install, attach, and control the propeller.

67. *Variable Pitch Propellers.*—Understand the operating principles and construction features of variable pitch propellers and their related components.

Select, install, adjust, and service variable pitch propellers and their related components.

68. *Propeller Maintenance Procedures and Techniques.* — Understand the propeller maintenance requirements and the procedures and techniques necessary to meet the requirements.

Determine and use the appropriate procedures and techniques to meet the propeller's maintenance requirements.

69. *Generators and Generator Control.*—Understand the principles, operation, physical characteristics, and maintenance requirements of generators and generator controls.

Select, install, adjust, service, and maintain aircraft DC and AC generators and their controls.

70. *Motors and Motor Control.*—Understand the principles, operation, physical characteristics, and maintenance requirements of motors and motor controls.

Select, install, adjust, service, and maintain aircraft motors and their controls.

71. *Aircraft Electrical Systems.*—Understand the function and operation of the aircraft electrical system, the function and purpose of its component parts, and its maintenance requirements.

Select, install, adjust, service, and maintain the electrical system and its components, except those components not associated with the powerplant.

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ORAL AND PRACTICAL EXAMINATIONS

Oral and practical examinations are a physical and oral demonstration of mechanical skill. They are normally the final step in becoming certificated or in adding a rating to a mechanic certificate. The general certificate requirements and the experience requirements for the rating being sought must have been met and substantiated.

Mechanic oral and practical examinations are administered together. As a result, they are often thought of as a single examination and are frequently referred to as "the oral and practical examination." It is possible, though, to pass one and fail the other.

Oral and practical examinations are administered by FAA inspectors or by FAA designated mechanic examiners. The scope of the examinations is the same in either case, but individual circumstances may make examination by one more convenient than by the other.

Arrangements for examination by an FAA inspector should be made as far in advance as possible at a local FAA Flight Standards district office. The facility, tools, materials, and supplies required for the practical examination must be furnished or arranged for by the applicant. The suitability or acceptability of facilities can be determined at the time arrangements for examination are being made.

Mechanic examiners are private persons who have been designated to act as representatives of the FAA to conduct certain tests for the purpose of issuing mechanic certificates. Mechanic examiners are not employed by, nor in any way paid by, the FAA for the services rendered or for the use of the examination facility and materials furnished by them. Thus, they are authorized to charge a fee for administering examinations. The names and addresses of the mechanic examiners in each district are on file and can be obtained from the FAA district office serving that area.

An application for a mechanic certificate or rating should be completed before the oral and practical examinations are begun. The examiner will give detailed instructions, which should be followed carefully. The application form will become a part of a permanent record and as such must be correct before a certificate or rating can be issued. It also contains a section which will be photographically reproduced to provide the actual certificate.

Sample Oral Examination Questions

Some examples of the type of questions asked during the oral examination are:

1. How would you determine the leveling means for a specific aircraft?
2. What is a blind rivet and how is it used?
3. What is reinforcing tape and how is it used?
4. What is the difference between welding and brazing?
5. What is a circuit breaker and how does it work?
6. What are two causes of vapor lock in a fuel line?
7. What is the purpose of a pump unloading valve in a hydraulic system?
8. Which cylinder should be removed last during disassembly of a radial aircraft engine?
9. What is detonation and how is it harmful?
10. How would you check a magneto for correct internal timing?
11. What is the purpose of an engine oil dilution system?
12. How would you check a propeller for correct track?
13. How is the moment of an item of equipment determined in computing aircraft weight and balance?

Oral examinations cover the same general subject areas as written examinations. The oral questions will be concerned with the applicant's ability to make use of the knowledge that he has demonstrated by passing the written examination.

The practical examination consists of assigned work projects to test mechanical skill and ability to organize work, select and follow correct procedures, apply appropriate techniques, and determine an acceptable level of workmanship. A high level of manipulative skill in the more complex operations is not expected. Some of the basic skills must have been developed, however, and must be demonstrated during the practical examination. Project assignments that seem to require the demonstration of a complex skill usually prove to require only the demonstration of several very basic skills. Such assignments are usually made to conserve time rather than to make greater demands on the applicant.

The areas in which a demonstration of skill will be required can be determined by reference to the items in the section entitled "The Written Examination." Part B should be of particular value. Notice for instance, Item No. 3 entitled "Maintenance Forms and Records," Part B of which reads:

> Identify, complete, and make disposition of the forms and records required during the exercise of mechanic privileges.

In addition to limiting the subject matter for study purposes, Part B makes an excellent reference for determining the areas with which the practical examination will deal.

Typical Practical Examination Projects

The following are typical of the projects assigned during the practical examination:

1. Safety a turnbuckle.
2. Make a sheet metal splice.
3. Make a wood spar splice.
4. Ribstitch a wing.
5. Make a steel tube welded splice.
6. Attach an electrical cable terminal.
7. Make up a section of fuel line and install fittings.
8. Bleed and adjust hydraulic brakes.
9. Compute empty weight center of gravity and the most forward and rearward loaded center of gravity of an aircraft.
10. Time the valves of an engine.
11. Adjust a carburetor float level.
12. Remove, clean, inspect, and reinstall an engine oil filter.
13. Install and time engine magnetos.
14. Remove and install a propeller.
15. Execute a Major Repair and Alteration Form FAA–337.

Oral and practical examinations are graded as soon as they are completed. If all parts of the examinations are passed, the application for mechanic certificate or rating will be forwarded by the examiner for review and issuance of a mechanic certificate or additional rating.

If any part of the oral or practical examination is failed the examiner will enter the titles of the subjects failed, whether oral or practical, on a Notice of Disapproval of Application (Form FAA–666) which will be given to the applicant. He will also return to the applicant the Report of Airman Written Examination (Form FAA–578A) which was presented as evidence of having passed the written examination.

Application for reexamination can be made in 30 days. If Form FAA–666 is presented at the time of application, the reexamination will cover only the subjects failed. An applicant has the option of returning to the same examiner or appling to any FAA district office or any designated mechanic examiner for reexamination. The details regarding application for a written reexamination in less than the usual waiting period also apply to the oral and practical examinations.

The district office will issue a temporary mechanic certificate when all of the requirements have been met. The temporary certificate can be used until the permanent certificate is received, or for a maximum of 90 days. Permanent mechanic certificates are prepared and issued by the Airman Certification Branch of the Federal Aviation Agency and mailed to the address indicated on the application form.

The certificate entitles a mechanic to privileges which are identified by FAA Regulations. Regulations offering significant certificate privileges, such as the Regulations concerning mechanics, also require an equal measure of responsibility in their exercise. This responsibility can be discharged by observing the limitations imposed by the Regulations upon mechanic certificate holders. Mechanic privileges and limitations are described in the Federal Aviation Regulations Part 65.

SAMPLE WRITTEN EXAMINATION QUESTIONS

The written examination questions presented in this section are similar to those contained in official FAA written examinations. Sample examination questions are related to correspondingly numbered subject titles as presented in "The Written Examination" section of this guide.

1. What must a certificated mechanic with both airframe and powerplant ratings do prior to returning to service an aircraft on which he has performed and approved a 100-hour inspection?
   1. Make the proper entries in the appropriate logbooks.
   2. Present his work and records to a mechanic holding an Inspection Authorization for final approval and release.
   3. Complete the required copies of Form FAA–337, including an accurate description of the work performed, date, mechanic's name, and certificate number.
   4. Notify the local FAA maintenance inspector in writing of his intention to return the aircraft to service.

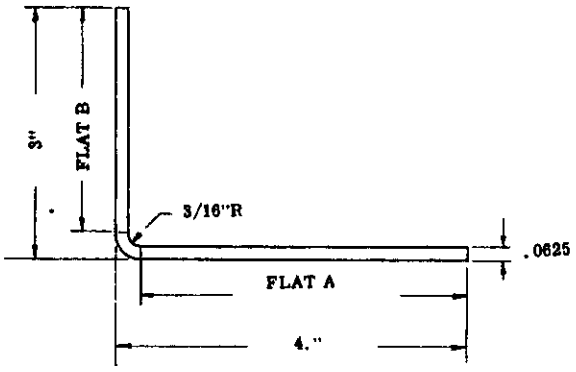
2. If an aircraft engine's maintenance or overhaul manual is not available, in which of the following can the necessary information for ignition timing be found?
   1. FAA Technical Manual No. 107—*Aircraft Powerplant Handbook.*
   2. FAA Aircraft Engine Specifications or Type Certificate Data Sheets.
   3. The aircraft owner's manual.
   4. The magneto maintenance or overhaul manual.

3. After making a structural major repair to an aircraft that is to be returned to service, Major Repair and Alteration Form FAA–337 must be prepared. How many copies are required and what is the final disposition of the completed forms?
   1. Three—one copy for the aircraft owner and two copies for the FAA.
   2. Two—one copy for the aircraft owner and one copy for the FAA.
   3. Three—one copy for the aircraft owner, one copy for the FAA, and one copy for the permanent records of the repairing agency or individual.
   4. Two—both copies for the FAA.

4. If the container volume of a confined gas is doubled (assume temperature remains constant) the pressure will
   1. increase in direct proportion to the volume increase.
   2. remain the same.
   3. be doubled.
   4. be reduced to one-half its original value.

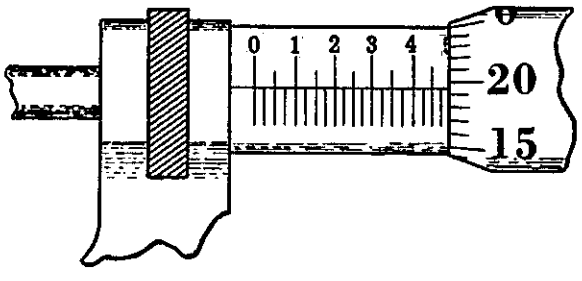
5. How many AN470AD–4–6 rivets will be required to attach a 10″ x 5″ splice plate if single row, minimum edge distance, 4D spacing is used?
   1. 60 rivets.
   2. 56 rivets.
   3. 62 rivets.
   4. 52 rivets.

6. Which of the following statements about Military Standard flareless fittings is correct?
   1. During installation, MS flareless fittings are normally tightened by turning the nut a specified amount after the sleeve and fitting sealing surface have made contact rather than being torqued.
   2. MS flareless fitting sleeves must *not* be preset on the line prior to final assembly.
   3. MS flareless fittings should *not* be lubricated prior to assembly.
   4. All the above statements are correct.



7. The length of flat A in the above drawing is
   1. 3.750 inches.
   2. 3.875 inches.
   3. 3.813 inches.
   4. 3.937 inches.

8. When making a forward weight and balance check to determine that the center of gravity will not exceed the forward limit during extreme conditions, the items of useful load which should be computed at their minimum weights are those located aft of the
   1. forward C.G. limit.
   2. rearward C.G. limit.
   3. datum.
   4. empty weight C.G.



9. The micrometer scale shown above indicates a measurement of
   1. 0.5195 inch.
   2. 0.4945 inch.
   3. 0.4695 inch.
   4. 0.4819 inch.

10. As the velocity of the air across an airplane wing increases, the pressure of the air on the upper surface
   1. increases.
   2. decreases.
   3. drops to zero.
   4. remains unchanged.

11. Which of the following nondestructive inspection methods is normally the most satisfactory to determine the internal structural condition of a highly stressed cast aluminum alloy fitting?
   1. Fluorescent penetrant inspection.
   2. Magnetic particle inspection.
   3. Dye penetrant inspection.
   4. X-ray or radiographic inspection.

12. If the cross-section area of a given conductor is increased to four times its original value and the length and temperature remain constant, the resistance of the conductor will be
   1. one-fourth its original value.
   2. four times its original value.
   3. the same as its original value.
   4. found by multiplying the original resistance by the percentage increase in cross-sectional area.

13. Which of the following sequences of connecting and tightening the battery leads should result in the safest procedure for installation of a battery in an aircraft with a single wire ground-return electrical system?
   1. Connect and tighten the negative (ground) lead before connecting the positive lead.
   2. Connect the negative (ground) lead, connect the positive lead, then tighten in the same order.
   3. Connect the positive lead, connect the negative (ground) lead, then tighten in the same order.
   4. Connect and tighten the positive lead before connecting the negative (ground) lead.

14. Persons performing a daily inspection in areas where high humidity and wide temperature changes exist should
   1. allow approximately one quart of fuel to flow from the sediment bowl drain.
   2. drain approximately one quart of fuel from the tank sump and the same amount from the sediment bowl.
   3. completely drain the fuel system and flush with alcohol.
   4. visually check the sediment bowl for the presence of water. If water is present, drain until fuel runs clear.

15. If an engine induction system fire occurs while starting, the operator should

1. discharge dry chemical into the engine intake immediately.
2. keep the engine running.
3. backfire the engine and blow out the fire.
4. discharge CO_2 into the engine intake immediately.

16. Which of the following statements relating to the conduct of a 100-hour inspection is true?

1. The inspecting agency shall use an inspection form as a checklist while performing a 100-hour inspection.
2. The inspecting agency is not required to use an inspection form as a checklist while performing a 100-hour inspection.
3. The inspecting agency shall use only the inspection form furnished and prescribed by the FAA Administrator as a checklist while performing a 100-hour inspection.
4. The inspecting agency shall use only the inspection form furnished and prescribed by the manufacturer as a checklist while performing a 100-hour inspection.

17. Which of the following has little or no effect upon the rate of vaporization of a given fuel?

1. The pressure of the surrounding air.
2. The temperature of the fuel.
3. The temperature of the surrounding air.
4. The antiknock value of the fuel.

18. If an aircraft is cruising in level flight and the stick or control column is moved forward the elevator will

1. go down and the nose of the aircraft will go down.
2. go up and the nose of the aircraft will go down.
3. go down and the nose of the aircraft will go up.
4. go up and the nose of the aircraft will go up.

19. During the periodic inspection of an airplane equipped with a push-pull tube type control system the threaded rod ends should

1. be checked for the amount of thread engagement by means of the inspection hole provided.
2. be checked to determine that the ball bearing end is properly safetied to the push-pull rod with brass or stainless steel safety wire.
3. be lubricated with waterproof high-pressure grease.
4. not be adjusted in length for rigging purposes because the rod ends have been properly positioned and staked during manufacture.

20. How should loosely adhering dust and dirt be removed from the exterior surfaces of aircraft transparent plastics?

1. Spray the surface with any commercial-type window-cleaning spray.
2. Wipe the surface with a moist chamois.
3. Flush the surface with water.
4. Wipe the surface with a dry cloth.

21. When rigging the wings on a monoplane equipped with front and rear lift struts, the general practice is to

1. control dihedral angle by the length of the front struts.
2. establish the incidence angle by the length of the front struts, and wash-in and wash-out by adjusting the length of the rear struts.
3. pre-rig the rear struts and adjust the length of front struts for propeller-torque correction as required.
4. use struts of fixed length and rig in propeller-torque correction by the use of ground adjustable rudder tabs.

22. It is not considered good aircraft finishing technique to

1. spray enamels over dopes or lacquers.
2. spray bituminous paint on wood.
3. spray dope or lacquer over unbaked enamels.
4. use zinc chromate primer on aluminum-alloy structures.

23. A lapped and doped spanwise seam at the trailing edge of a wing should be covered with surface tape at least 3 inches wide. Prior

to application, the surface tape should be notched at intervals not to exceed 6 inches to

1. make it easier to put on severe curvatures.
2. prevent the entire tape from loosening in the event the tape begins to separate.
3. increase the length of the tape's edges for better doping.
4. prevent raveling of the tape.

24. Repairs or splices involving stringers on the lower surface of stressed skin metal wings are usually

1. not permitted.
2. permitted but are normally more critical in reference to strength than similar repairs to the stringers on the upper surface.
3. permitted but are normally more critical in reference to aerodynamic cleanness than similar repairs to the upper surface.
4. Permitted only if the damage does not exceed 6 inches in any direction.

25. Which of the following is *not* indicated by the aluminum sheet designation ALCLAD 2024–T36?

1. The specific process or combination of operations used to produce the stable temper.
2. The nominal thickness of the sheet.
3. Major alloying element.
4. Method used to produce stable temper (whether strain hardened or heat treated).

26. When steel hi-shear rivets are used to assemble aluminum alloy structural components they should be

1. used at no greater ratio than one hi-shear rivet for each three aluminum alloy rivets.
2. driven at 830° to 860° F. in order to reduce the possibility of cracking.
3. coated with zinc chromate primer prior to assembly to reduce dissimilar metal corrosion.
4. fitted to extremely close tolerances.

27. If it is necessary to adjust several valves in a hydraulic system, what particular sequence, if any, should be followed?

1. Units with the highest pressure settings are adjusted first.
2. Units with the lowest specified pressure settings should be adjusted first.
3. Units are independent of each other and therefore no particular sequence is necessary.
4. Units most distant from the hydraulic pump should be adjusted first.

28. The type of fluid to be used in an aircraft hydraulic system can be determined

1. only by a chemical analysis of a sample of fluid from the system.
2. by the markings on or near the reservoir filler opening.
3. by the color code attached to the hydraulic lines.
4. by mixing a sample of the fluid to be added with a sample of the fluid in the system and observing the reaction.

29. What will cause an engine-driven hydraulic pump of the correct capacity to fail to maintain normal system pressure during the operation of a cowl flap actuating unit?

1. Severe bends in the cowl flap actuating cylinder lines.
2. Severe restriction in the pump outlet.
3. A partial restriction in the in-port of the selector valve.
4. A partial restriction in the out-port of the selector valve.

30. Many landing gear systems use sequence valves to cause one hydraulic operation to follow another in a definite order. These valves are classified as

1. pressure control valves.
2. flow control valves.
3. timelag valves.
4. automatic crossflow valves.

31. Shuttle valves installed in large aircraft braking systems allow

1. two independent systems to operate the same actuator if necessary.
2. the safe application of brakes regardless of ground speed due to the compensating action of the valves.
3. fluid to bypass from the right wheel cylinder to the left wheel cylinder if braking pressures are different.
4. the compensating port, interconnecting both master cylinders, to discharge fluid alternately from one to the other.

32. An aircraft pneumatic system which incorporates an engine-driven multistage reciprocating compressor, also requires
1. a moisture separator.
2. an oil separator.
3. a surge chamber.
4. a vacuum relief valve.

33. Built-in aircraft fire extinguishing systems ordinarily are charged with
1. carbon dioxide and nitrogen.
2. carbon tetrachloride.
3. sodium bicarbonate.
4. freon and nitrogen.

34. Cabin pressurization differential pressure is normally controlled by
1. varying the outflow valve position with changes of engine RPM at constant altitude.
2. maintaining cabin supercharger speed at a fixed rate regardless of altitude by a constant speed drive.
3. constant volume cabin superchargers and an automatically positioned cabin outflow valve.
4. manually regulating the setting of the butterfly valve located between the supercharger and the cabin.

35. Instrument static system leakage can be detected by observing the rate of change in indication of the
1. altimeter after pressure has been applied to the static system to cause a prescribed equivalent altitude to be indicated.
2. airspeed indicator after pressure has been applied to the static system to cause a prescribed equivalent airspeed to be indicated.
3. altimeter after suction has been applied to the static system to cause a prescribed equivalent altitude to be indicated.
4. airspeed indicator after suction has been applied to the static system to cause a prescribed equivalent airspeed to be indicated.

36. The wing leading edges of transport category turbojet airplanes are generally protected from ice accumulation by
1. hot air bleed from the engine compressor section to the leading edge.
2. hot air from combustion heaters which are located in each wing.
3. electrically heated synthetic rubber boots over the leading edge.
4. pneumatically operated expansion boots on the leading edge.

37. Aircraft equipped with a direct current electrical system often require a source of alternating current to operate communication or navigation equipment. What electrical device is used to convert DC to AC?
1. A rectifier.
2. An inverter.
3. An exciter.
4. A capacitor.

38. What effect will increased generator voltage have on the strength of the electromagnet which controls the pressure applied to the stack of carbon discs in a carbon pile voltage regulator?
1. Both magnet strength and the pressure applied to the carbon discs will increase.
2. Both magnet strength and the pressure applied to the carbon discs will decrease.
3. Magnet strength will decrease and the pressure applied to the carbon discs will increase.
4. Magnet strength will increase and the pressure applied to the carbon discs will decrease.

39. Which of the following methods will be effective in reversing the direction of rotation of a DC electric motor?
1. Reverse the direction of current flow through either the field or the armature.
2. Reverse the direction of current flow through the motor.
3. Rotate the brush assembly approximately 90 degrees.
4. Move the starting winding 180 degrees from its present position.

40. Which of the following is *not* a recommended aircraft electric cable practice?
1. All cables to single items of equipment should be grouped separately.
2. Insulating tubing should be installed over terminals and disconnect splices.

3. All splices in adjacent parallel conductors should be staggered.
4. Alternating current cables should be grouped with (other) direct current cables.

41. What effect will increased humidity have on engine power output?

1. No appreciable change in power output.
2. Power output will decrease at all altitudes.
3. Power output will increase at all altitudes.
4. No effect at sea level but greater power output at altitude.

42. Where in the airstream is the induction system screen located in a reciprocating engine?

1. After the carburetor.
2. Before the carburetor if the engine is equipped with a downdraft carburetor and after the carburetor if the engine is equipped with an updraft carburetor.
3. Before the carburetor.
4. Before the carburetor if the engine is equipped with an updraft carburetor and after the carburetor if the engine is equipped with a downdraft carburetor.

43. What method is ordinarily used to make idle speed adjustments on a float-type carburetor?

1. An adjustable throttle stop or linkage.
2. A variable restriction in the drilled passageway which connects the air space of the float chamber and the carburetor venturi.
3. An orifice and adjustable tapered needle.
4. A variable restriction in the idle system fuel supply.

44. As the density of air decreases with increased altitude the automatic mixture control (AMC) unit on a pressure carburetor will cause the air metering force to

1. increase by restricting the flow of air from chamber B (boost venturi suction).
2. increase by reducing the restriction to the flow of air to chamber A (impact pressure).
3. decrease by reducing the restriction to the flow of air from chamber B (impact pressure).
4. decrease by restricting the flow of air to chamber A (impact pressure).

45. Aircraft engine direct cylinder fuel injection systems normally discharge fuel into each cylinder during which stroke(s)?

1. Compression.
2. Intake.
3. All (continuously).
4. Intake and compression.

46. The use of water injection permits an engine to be operated at high power output by

1. enriching the mixture.
2. suppressing detonation.
3. cooling the fuel-air charge as it passes through the intake manifold.
4. increasing the octane rating of the fuel.

47. Which of the following is *not* a factor in the operation of an automatic fuel control unit used on a turbojet engine?

1. Mixture control position.
2. Compressor inlet air density.
3. Compressor RPM.
4. Throttle position.

48. When a single-stage, two-speed supercharger is shifted from low to high impeller ratio during a ground check there should be

1. a momentary drop in oil pressure, no drop in manifold pressure, and no change in RPM.
2. a momentary drop in oil pressure, a slight rise in manifold pressure, and an increase in RPM.
3. no drop in oil pressure, no drop in manifold pressure, and an increase in RPM.
4. no drop in oil pressure, a slight drop in manifold pressure, and a decrease in RPM.

49. When does ignition occur in a four-stroke cycle engine?

1. Before the piston reaches top center on the compression stroke.
2. At top center of the compression stroke.

3. At the beginning of the power stroke.
4. After the piston begins its downward travel on the power stroke.

50. Burned or electrically distorted magneto breaker point contact surfaces usually indicate
1. primary circuit condenser not functioning properly.
2. use of improper fuel.
3. poor point lubrication.
4. shorted spark plug leads.

51. If several long lengths of high-tension ignition cable are to be installed in a rigid shielded ignition manifold, the possibility of damage to the cable as it is pulled through the conduit will be reduced by
1. dusting the cables with powdered graphite prior to installation.
2. dusting the cable with powdered soapstone.
3. blowing powdered graphite into the ignition manifold before the cables are installed.
4. the application of a light coat of oil or synthetic grease.

52. Which statement about the ignition system of a turbojet engine is correct?
1. It is a low voltage, high amperage system.
2. The engine will operate normally after start if the ignition system is deenergized.
3. The engine will not continue to operate after start if the ignition system is deenergized.
4. The system generally includes a polar inductor type magneto.

53. To what does the term "spark plug reach" refer?
1. The length of the threaded portion of the shell.
2. The amount of center electrode exposed to the heat of combustion.
3. The heat range within which the spark plug is designed to operate.
4. The amount of insulator exposed to the heat of combustion.

54. An impulse coupling gives a momentary high spin to the magneto rotor and
1. retards the spark a predetermined amount during the starting process.
2. disengages the trailing electrode.
3. feeds battery current into the primary circuit of the magneto.
4. momentarily shorts out the primary condenser; thus, assists in giving a very "hot" spark for starting.

55. What is the number of crankshaft revolutions required to cause the five-lobe cam plate of a nine-cylinder radial engine to turn one complete revolution?
1. 2.
2. 5.
3. 10.
4. 4½.

56. If an engine equipped with a constant speed propeller is operated at part throttle and at cruising RPM, a reduction in RPM with no change in throttle setting will result in
1. no change in manifold pressure.
2. an increase in manifold pressure.
3. a decrease in bmep.
4. a decrease in manifold pressure.

57. What is the most probable cause if sudden throttle changes result in excessive engine vibration?
1. Worn throttle linkage.
2. Warped intake valves.
3. Worn or loose engine mounts.
4. Late magneto timing.

58. Thermocouple type temperature indicating instrument systems
1. require no external power source.
2. are classed as balanced type, variable resistor circuits.
3. usually contain a balancing circuit in the instrument case to prevent fluctuations of the aircraft electrical system voltage from affecting the temperature reading.
4. will not indicate a true reading if the aircraft electrical system voltage varies beyond the range for which the instruments are calibrated.

59. How should corrosion resisting steel parts such as exhaust collectors be blast cleaned?
1. Use steel grit which has not previously been used on soft iron.
2. Use walnut shells only.

3. Use soft iron chill which has not previously been used on hardened steel.
4. Use sand which has not previously been used on iron or steel.

60. Which of the following is correct in reference to installation of aluminum alloy baffle brackets under cylinder hold down nuts?

1. The practice is not recommended.
2. It is considered good practice because the soft aluminum will allow the nut to align perfectly with the cylinder flange surface.
3. It is not recommended unless all contact surfaces are properly treated to eliminate the possibility of dissimilar metals corrosion.
4. It is considered good practice unless the added thickness of the bracket does not allow the nut slot to line up with the cotter pin hole within the range of recommended torque values.

61. What should be done before adjusting (to the "cold" clearance setting) the valve clearance of a nine-cylinder radial engine equipped with a four-lobe double-track cam ring?

1. Remove and visually inspect all cam follower assemblies.
2. Open all valve clearances to the "hot" or "timing" setting.
3. Determine the least worn cam flat on each track.
4. Open all valve clearances to approximately twice the required setting.

62. In order to maintain a constant oil pressure as the clearances between the moving parts of an engine increase through normal wear, the supply pump output must

1. increase as the resistance offered to the flow of oil decreases.
2. decrease as the resistance offered to the flow of oil decreases.
3. increase as the resistance offered to the flow of oil increases.
4. decrease as the resistance offered to the flow of oil increases.

63. The purpose of the bypass valve on an oil cooler is to bypass the

1. hot oil into the hopper tank directly.
2. cold oil into the oil filter.
3. hot oil past the "Y" drain.
4. cold oil into the hopper tank directly.

64. Which of the following is referred to as the propeller blade face?

1. The root end of a propeller blade.
2. The flat side of a propeller blade.
3. The cambered side of a propeller blade.
4. The cuff around a propeller blade.

65. Hydraulically operated propellers, that are in the low RPM position for starting, should not be changed to the high RPM setting until a steady oil pressure is obtained. This procedure is followed to prevent

1. congealing of the oil in the nose case scavenger system.
2. erratic pitch change during later propeller operation.
3. oil starvation of the highly stressed engine bearings.
4. the possibility of an airlock forming in the propeller governor boost pump.

66. What is the primary purpose of propeller cones, as used with propellers that are installed on engines with splined shafts?

1. To prevent contact between the shaft splines and the propeller hub splines.
2. To prevent rotation of the propeller on the shaft.
3. To reduce acceleration loads on the shaft splines.
4. To center the propeller on the shaft.

67. If a constant speed propeller control is set in the constant speed range and the engine is being operated at cruising power,

1. retarding the throttle will result in an increase in blade pitch.
2. movement of the throttle will have no effect on blade pitch.
3. the RPM will vary directly with movement of the throttle.
4. advancing the throttle will result in an increase in blade pitch.

68. Select the proper sequence to be followed when using the etching process as an inspection method for determining the surface condition of an aluminum alloy propeller blade.

1. Nitric acid etch, water rinse.
2. Nitric acid etch, caustic bath, water rinse.

3. Abrasive cleaning, nitric acid etch, water rinse, caustic bath, water rinse.
4. Abrasive cleaning, caustic etch, water rinse, nitric acid bath, water rinse.

69. A four-pole series generator that is 80 percent efficient furnishes 100 amperes to its load at 5,000 RPM. How much current will flow through each of the field windings? (NOTE: Disregard line losses.)

1. 25 amperes.
2. 20 amperes.
3. 80 amperes.
4. 100 amperes.

70. Why is a double field winding (split field) used in some DC electric motors?

1. To allow the motor to operate in either direction (reversible motor).
2. One set of field windings is used as a magnetizing coil to actuate the armature brake.
3. One set of field windings is used as a magnetizing coil to engage the motor clutch.
4. One set of field windings is used as a magnetizing coil to disengage the motor clutch.

71. Electric circuits are protected from overheating by

1. fuses or circuit breakers.
2. shunts.
3. solenoids.
4. thermocouples.

Answers to Sample Examination Items

Item	Answer Number	Item	Answer Number	Item	Answer Number
1	1	25	2	49	1
2	2	26	4	50	1
3	2	27	1	51	2
4	4	28	2	52	2
5	2	29	2	53	1
6	1	30	2	54	1
7	1	31	1	55	3
8	1	32	1	56	2
9	2	33	1	57	3
10	2	34	3	58	1
11	4	35	3	59	4
12	1	36	1	60	1
13	4	37	2	61	3
14	2	38	4	62	1
15	2	39	1	63	4
16	1	40	4	64	2
17	4	41	2	65	3
18	1	42	3	66	4
19	1	43	1	67	4
20	3	44	4	68	4
21	1	45	2	69	4
22	3	46	2	70	1
23	2	47	1	71	1
24	2	48	2		

RECOMMENDED STUDY MATERIALS

The FAA publications listed in this section will be helpful to persons studying for Airframe and Powerplant Examinations. Of the greatest value will be FAR 65 pertaining to mechanic certificate requirements, privileges, and limitations; CAM 18 which deals with maintenance, repair, and alteration of aircraft; and CAM 43 which contains general operating rules.

The publications listed cannot be depended upon to provide the total technical information required for either rating. It is the responsibility of each applicant to obtain study material appropriate to his own needs. A variety of excellent text and reference material is available from commercial publishers. Most public and institutional libraries maintain technical reference sections and can often recommend specific textbooks and authors. Textbook publishers will usually furnish a listing of their publications that are used in aviation mechanic schools.

The appendix contains complete titles and more information about the FARs and CAMs listed and about the regulation recodification program. Except as noted, all of the publications listed are available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Federal Aviation Regulations.—Parts 1, 21, 23, 25, 27, 29, 33 (powerplant only), 35 (powerplant only), 37, 39, 41, 43, 45, 47, 65, and 91.

NOTE.—Parts 1 and 65 are available at the time of this printing. The remainder of the Parts listed above (when available) will contain the regulations now contained in the CAMs listed below.

Civil Aeronautics Manuals.—1, 3, 4b, 5 (airframe only), 6, 7, 8, 9, 13 (powerplant only), 14 (powerplant only), 18, and 43.

NOTE.—CAMs will be available only until replaced by FARs. See the appendix for information about the recodification program.

Technical Manuals.—Civil Aeronautics Technical Manual 101, *Personal Aircraft Inspection Manual.* Price: 75¢. Civil Aeronautics Technical Manual 107, *Aircraft Powerplant Handbook* (for powerplant rating only). Price: $1.50.

Miscellaneous Publications

The following publications are valuable and often needed during the exercise of certain mechanic privileges. Mechanic applicants should know what type of information they contain, but may find it inadvisable to purchase them for study purposes only.

Aircraft Specifications.—Basic subscription consists of a set of specifications in all weight groups plus monthly supplements for about a year; the aircraft listing; and index. Price: $13.00; $16.75 foreign.

Engine and Propeller Specifications.—Basic subscription consists of sets of engine and propeller specifications plus monthly supplements for about a year; the listings and indexes. Price: $8.00; $10.00 foreign.

Airworthiness Directives.—Part 507 of the Regulations of the Administrator. Basic subscription consists of Airworthiness Directives issued prior to January 1, 1962, and annual supplements. Price: $4.50; $5.50 foreign.

Bi-Weekly Airworthiness Directive Cards.—Free mailing list service for the cards is available from the FAA on request. Address requests to the Federal Aviation Agency, Publishing and Graphics Branch, Washington 25, D.C.

General Aviation Inspection Aids Summary.—Basic subscription includes Summary and 11 monthly Supplements. Price: $1.25; $1.75 foreign.

"C" Series Technical Standard Orders—Aircraft Components.—Index and free mailing list service are furnished by the FAA on request. Address requests to the Federal Aviation Agency, Publishing and Graphics Branch, Washington 25, D.C.

APPENDIX

FEDERAL AVIATION REGULATIONS (NEW) AND CIVIL AERONAUTICS MANUALS

The present Federal Aviation Agency regulatory system, which embraces the Civil Air Regulations, Special Civil Air Regulations, Civil Aeronautics Manuals, Regulations of the Administrator, etc., is being revised to reflect the consolidation of the rulemaking authority effected by the Federal Aviation Act of 1958.

The recodification program is designed to restate the rules and regulatory materials by adopting a straight subject matter arrangement of Parts called Federal Aviation Regulations (FARs). An outline of this program is given in the appendix to new Part 1 of the FARs.

In the interim, the old Regulations and CAMs will remain in effect until superseded by the new FARs. On the effective date of each new FAR, the old Regulation or CAM will become obsolete.

Availability and price information have been omitted from the following lists because of the changes being brought about by the recodification program. Availability, price, and ordering instructions for FARs and CAMs can be obtained by writing to the Federal Aviation Agency, Publishing and Graphics Branch, Attention: MS–158, Washington 25, D.C., and requesting a free publication status sheet.

FEDERAL AVIATION REGULATIONS

The FARs available at the time of printing of this list are indicated by an asterisk (*) preceding the Part number.

Subchapter A—DEFINITIONS [New]

*PART 1—Definitions and Abbreviations [New]

Subchapter B—PROCEDURAL RULES [New]

*PART 11—General Rule-Making Procedures [New]

*PART 13—Enforcement Procedures [New]

Subchapter C—AIRCRAFT [New]

PART 21—Aircraft Certification Procedures [New]

PART 23—Airworthiness Standards: Normal, Utility, and Acrobatic Category Airplanes [New]

PART 25—Airworthiness Standards: Transport Category Airplanes [New]

PART 27—Airworthiness Standards: Normal Rotorcraft [New]

PART 29—Airworthiness Standards: Transport Rotorcraft [New]

PART 33—Airworthiness Standards: Aircraft Engines [New]

PART 35—Airworthiness Standards: Propellers [New]

PART 37—Technical Standard Orders for Materials, Parts, and Appliances [New]

PART 39—Airworthiness Directives [New]

PART 41—Airworthiness Operating and Equipment Standards [New]

PART 43—Maintenance and Alteration [New]

PART 45—Identification and Registration Marking [New]

PART 47—Aircraft Registration [New]

PART 49—Recording of Aircraft Title and Security Documents [New]

Subchapter D—AIRMEN [New]

*PART 61—Certification: Pilots and Flight Instructors [New]

*PART 63—Certification: Flight Crewmembers Other Than Pilots [New]
*PART 65—Certification: Airmen Other Than Flight Crewmembers [New]
*PART 67—Medical Standards and Certification [New]

Subchapter E—AIRSPACE [New]

*PART 71—Designation of Federal Airways, Controlled Airspace, and Reporting Points [New]
*PART 73—Special Use Airspace [New]
*PART 75—Establishment of Jet Routes [New]
*PART 77—Notice of Construction or Alteration Affecting Navigable Airspace [New]

Subchapter F—AIR TRAFFIC AND GENERAL OPERATING RULES [New]

PART 91—General Operating and Flight Rules [New]
PART 93—Special Air Traffic Rules and Airport Traffic Patterns [New]
PART 95—Minimum IFR Altitudes [New]
PART 97—Standard Instrument Approach Procedures [New]
PART 99—Security Control of Air Traffic [New]
PART 101—Moored Balloons and Kites [New]
PART 103—Transportation of Dangerous Articles and Magnetized Materials [New]
*PART 105—Parachute Jumping [New]

Subchapter G—AIR CARRIER AND COMMERCIAL OPERATOR CERTIFICATION AND OPERATIONS [New]

PART 121—Certification of Air Carriers and Commercial Operators of Large Aircraft [New]
PART 123—Operations of Air Carriers and Commercial Operators of Large Aircraft [New]
PART 125—Air Taxi Operators and Commercial Operators of Small Aircraft [New]
PART 127—Operations of Foreign Air Carriers [New]

Subchapter H—SCHOOLS AND OTHER CERTIFICATED AGENCIES [New]

*PART 141—Pilot Schools [New]
*PART 143—Ground Instructors [New]
*PART 145—Repair Stations [New]
*PART 147—Mechanic Schools [New]
*PART 149—Parachute Lofts [New]

Subchapter I—AIRPORTS [New]

*PART 151—Federal Aid to Airports [New]
*PART 153—Acquisition of U.S. Land for Public Airports [New]
*PART 155—Release of Airport Property From Surplus Property Disposal Restrictions [New]
*PART 157—Notice of Construction, Alteration, or Deactivation of Airports [New]
*PART 159—National Capital Airports [New]
*PART 161—Cold Bay, Alaska, Airport [New]
*PART 163—Canton Island Airport [New]
*PART 165—Wake Island Code [New]

Subchapter J—AIR NAVIGATIONAL FACILITIES [New]

PART 171—Use of Domestic Non-Federal Navigation Facilities [New]

Subchapter K—ADMINISTRATIVE REGULATIONS [New]

*PART 181—Seal [New]
*PART 183—Representatives of the Administrator [New]
*PART 185—Testimony by Employees and Production of Records in Legal Proceedings [New]
*PART 187—Fees for Copying and Certifying Federal Aviation Agency Records [New]
*PART 189—Use of Federal Aviation Agency Communications Systems [New]

CIVIL AERONAUTICS MANUALS

The Civil Aeronautics Manuals listed below have not been superseded by new FARs at the time of printing this list.

CAM 1—Certification, Identification and Marking of Aircraft and Related Products

CAM 3—Airplane Airworthiness—Normal, Utility and Acrobatic Categories

CAM 4a—Airplane Airworthiness

CAM 4b—Airplane Airworthiness — Transport Categories

CAM 5—Glider Airworthiness

CAM 6—Rotorcraft Airworthiness; Normal Category

CAM 7—Rotorcraft Airworthiness; Transport Categories

CAM 8—Aircraft Airworthiness—Restricted Category

CAM 9—Aircraft Airworthiness — Limited Category

CAM 10—Certification and Approval of Import Aircraft and Related Products

CAM 13—Aircraft Engine Airworthiness

CAM 14—Aircraft Propeller Airworthiness

CAM 18—Maintenance, Repair, and Alteration of Airframes, Powerplants, Propellers, and Appliances

CAM 40—Scheduled Interstate Air Carrier Certification and Operation Rules

CAM 41—Certification and Operation Rules for Scheduled Air Carrier Operations Outside the Continental Limits of the United States

CAM 42—Irregular Air Carrier and Off-Route Rules

CAM 43—General Operation Rules

CAM 44—Foreign Air Carrier Regulations

CAM 45—Commercial Operator Certification and Operation Rules

CAM 46—Scheduled Air Carrier Helicopter Certification and Operation Rules

CAM 48—Operation of Moored Balloons and Large Kites

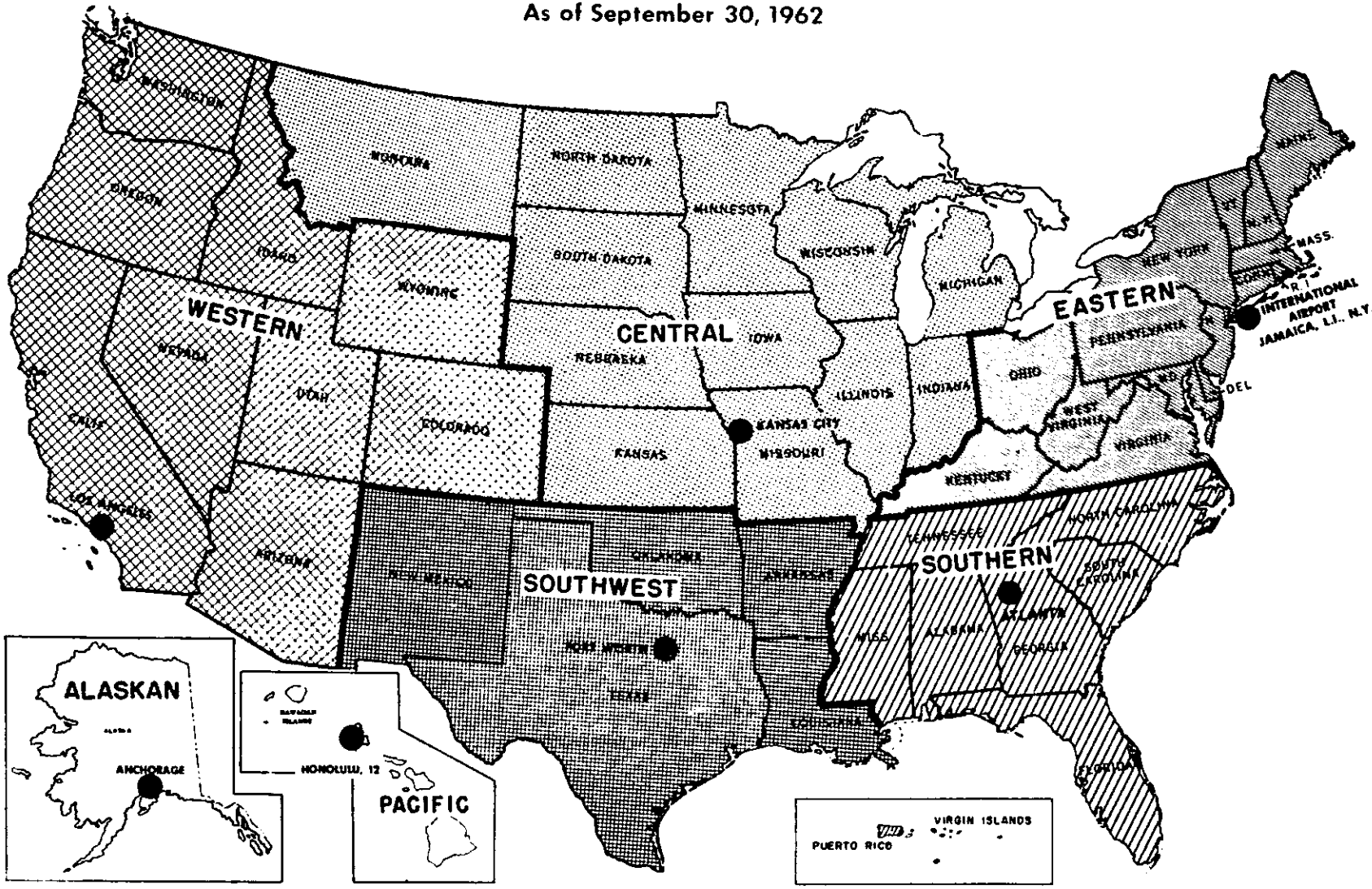
CAM 49—Transportation of Explosives and Other Dangerous Articles

CAM 60—Air Traffic Rules

CAM 190—Authorization of Navigation of Foreign Civil Aircraft Within the United States.

REGIONAL BOUNDARIES AND OFFICES OF THE FEDERAL AVIATION AGENCY

As of September 30, 1962



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FAA Regional Headquarters
632—6th Avenue
Anchorage, Alaska

CENTRAL REGION
FAA Regional Headquarters
4825 Troost Avenue
Kansas City 10, Missouri

EASTERN REGION
FAA Regional Headquarters
New York International Airport
Federal Building
Jamaica, New York

PACIFIC REGION
FAA Regional Headquarters
P.O. Box 4009
Honolulu 12, Hawaii

SOUTHERN REGION
FAA Regional Headquarters
P.O. Box 20636
Atlanta 20, Georgia

SOUTHWEST REGION
FAA Regional Headquarters
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Fort Worth 1, Texas

WESTERN REGION
FAA Regional Headquarters
5651 West Manchester Avenue
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Los Angeles 9, California

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