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CIVIL AERONAUTICS AUTHORITY

WASHINGTON, D.C.

AMENDMENT OF THE

C I V I L A I R R E G U L A T I O N S

PART 53

MECHANIC SCHOOL RATING

(Including a Related Manual)

CIVIL AERONAUTICS AUTHORITY
WASHINGTON, D. C.

AMENDMENT OF THE CIVIL AIR REGULATIONS

Addition of Part 53

This revision was adopted by the Authority on October 3, 1939, but is not effective, and will not be made effective until the necessary forms, instructions, and procedures have been drafted and promulgated.

AMENDMENT NO. 31
OF THE CIVIL AIR
REGULATIONS

PROVIDING FOR THE RATING AND CERTIFICATION OF CIVILIAN SCHOOLS GIVING INSTRUCTION IN AIRCRAFT AND AIRCRAFT ENGINE MECHANICS

Effective _____*, the Civil Air Regulations are amended by adding a new Part as follows:

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* NOTE: This amendment will not become effective until the necessary forms, instructions, and procedures have been drafted and promulgated.

" PART 53--MECHANIC SCHOOL RATING

Sec.		Sec.	
53.1	Mechanic school rating certificate requirements.	53.25	Credit for extra curricular work.
53.10	Curriculum.	53.	Mechanic school certificate.
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		53.42	Maintenance of facilities, equipment and material.

53.1 Mechanic school rating certificate requirements.

To be eligible for a rating as a mechanic school and certification as such an applicant shall comply with the following requirements:

53.10 Curriculum.

(a) An applicant shall have a curriculum of not less than 1350 hours of instruction in the theory and practice of construction, inspection, maintenance, overhaul, and repair of aircraft, aircraft engines, propellers, and their appliances, and in the contents of the applicable Civil Air Regulations. This curriculum shall be designed to be completed in not less than one year.

(b) The applicant may also secure approval by the Authority of the following additional curricula:

(1) An aircraft curriculum which shall include all subjects appearing in the aircraft and aircraft engine curriculum specifically dealing with aircraft, including the applicable provisions of the Civil Air Regulations. This curriculum shall include not less than 960 hours of instruction and shall be designed to be completed in not less than 8 months.

(2) An aircraft engine curriculum which shall include all subjects appearing in the aircraft and aircraft engine curriculum specifically dealing with aircraft power plants, including the applicable provisions of the Civil Air Regulations. This curriculum shall include not less than 960 hours of instruction and be designed to be completed in not less than 8 months.

(c) Each curriculum described in this section shall provide for instruction in all the subjects necessary properly to qualify the student to perform the duties and functions of the position for which he may seek an airman certificate.

53.11 Mechanic instructors. The applicant shall have, for all subjects included in any approved curriculum, instructors holding valid mechanic certificates and valid ground instructor certificates, with ratings for each certificate appropriate for the subject or subjects in which such persons

give instruction: Provided, That the applicant may be deemed to have met this requirement if he shows that any such instruction being given by a person not so rated and certificated is being given under the direct supervision of a full-time instructor with the certificate and ratings required by this section.

53.12 Mechanic instructors, ratio. The applicant shall have at least one instructor giving instruction in each subject in an approved curriculum for each 25 students simultaneously receiving instruction in that subject.

53.13 Facilities, equipment and material. An applicant shall have the following facilities, equipment, and material:

(a) Suitable classrooms adequate to accommodate the largest number of students scheduled for attendance at any one time. Such classrooms shall be properly heated, lighted and ventilated.

(b) Suitable shop space adequate to accommodate the largest number of students scheduled for attendance at any one time. Such shop space shall be at least 10,000 sq. ft. in area and shall be properly heated, lighted and ventilated.

(c) Material and equipment of the kind and quantity necessary to give each student theoretical and practical training in the use of such material and equipment sufficient to qualify him to perform the duties and functions of the position for which he may seek an airman certificate.

53.2 Student instruction.

53.20 Student examinations. Upon completion of each subject included in any approved curriculum, each student taking such subject shall be given an appropriate examination. The student's examination, or, in the case of a practical examination, a report thereof, shall be kept by the school as a part of its records for not less than one year from the date of the termination of the student's enrollment.

53.21 Records. Certificated mechanic schools shall keep an accurate individual record of each student enrolled therein, which record shall include a chronological log of all instruction, attendance, subjects covered, examinations and examination grades. The entire record shall be certified by an authorized official of the school familiar with the facts contained therein.

53.22 Reports. On the first day of January and July of each year and at such other times as the Authority may require, every holder of a mechanic school certificate shall transmit to the Authority a correct and completely executed report on the form prescribed and furnished by the Authority. Such report shall include the following information as to students enrolled in the course or courses approved by the Authority:

(a) The names of all students enrolled.

(b) The course or courses for which they are enrolled.

(c) The names of the students who have been graduated

within the period covered by the report and the course or courses from which graduated.

(d) The names of all students dropped from enrollment, within the period covered by the report, and the reasons therefor.

53.23 Graduation certificate. Each student graduating from a certificated mechanic school who has satisfactorily completed an approved curriculum shall be given a graduation certificate executed on a form prescribed and furnished by the Authority.

53.24 Standard of instruction. The standard of instruction in a certificated mechanic school shall be sufficiently high to insure that an average of eight out of ten of its graduates, who apply within one year after graduation, will qualify for a mechanic certificate and rating corresponding to the curriculum from which they were graduated. This average shall be computed on the basis of the number of students, graduated by the school during each six months' period after January 1, 1940, who apply and are examined for the mechanic certificate and rating corresponding to the curriculum from which they were graduated.

53.25 Credit for extra-curricular work. A student who is engaged in a mechanical occupation, the nature of which is comparable to some portion of the curriculum in which he is enrolled, may receive credit for a number of

hours equivalent to the experience received, in lieu of such portion of the curriculum; Provided, That such credit shall not exceed 400 hours in the 1650 hour curriculum, nor 200 hours in each 960 hour curriculum.

53.26 Hours of attendance. No student shall be given a graduation certificate unless such student has been in attendance not less than 98 percent of the total hours required by the school to complete the approved curriculum for which he was enrolled.

53.3 Mechanic school certificate.

53.30 Application. Application for a mechanic school certificate shall be made upon the applicable form prescribed and furnished by the Authority, and shall be accompanied by two copies of any proposed curriculum.

53.31 Display. A mechanic school certificate shall be presented for inspection upon the reasonable request of any person.

53.32 Duration. A mechanic school certificate shall be of 60 days' duration and, unless the holder thereof is otherwise notified by the Authority within such period, shall continue in effect indefinitely thereafter, unless suspended or revoked by the Authority.

53.33 Non-transferability. A mechanic school certificate is not transferable.

53.34 Surrender. Upon the suspension, revocation, or expiration of a mechanic school certificate, the holder of

such certificate shall, upon request, surrender such certificate to any officer or employee of the Authority.

53.35 Inspection. The applicant for a mechanic school certificate shall offer full cooperation with respect to any inspection or examination which may be made of said applicant, its personnel, facilities, equipment, and records, upon proper request by any authorized representative of the Authority prior or subsequent to the issuance of a mechanic school certificate.

53.4 General rules.

53.40 Advertising. No certificated mechanic school shall in any manner make any statement pertaining to such school which is false or is designed to mislead any person contemplating enrollment in such school: Provided, That any advertising which indicates that such school is approved by the Authority shall clearly differentiate between those subjects which have been approved by the Authority and those which have not.

53.41 Curriculum changes. No change shall be made in any approved curriculum prior to approval of the change by the Authority. Unless the school is notified to the contrary within 60 days after submission of the proposed change to the Authority, such change will be deemed to have been approved.

53.42 Maintenance of facilities, equipment and material. The holder of a currently effective mechanic school certificate shall maintain personnel, facilities, equipment, and material at least equal in quality and quantity to those required for the issuance of such a certificate."

STANDARDS OF APPROVAL FOR RATING OF CIVILIAN SCHOOLS GIVING INSTRUCTION IN AIRCRAFT AND AIRCRAFT ENGINE MECHANICS

Pursuant to the provisions of Part 53 of the Civil Air Regulations, the following standards of approval are issued to cover the courses to be included in the curriculum of, and the facilities, equipment and material necessary for, civilian schools giving instruction in aircraft and aircraft engine mechanics.

A. S. KOCH, Chief,
Certificate and Inspection Division,
Civil Aeronautics Authority.

AIRCRAFT CURRICULUM

1. AIRCRAFT, THEORY AND PRACTICE.

   (a) Elementary theory of flight.

   (b) Airfoils, controls, and their effect on flight.

   (c) Nomenclature of the aircraft, its component parts and appliances.

   (d) Aircraft stability and flight characteristics.

   (e) Weight and balance and its effect upon stability.

2. MECHANICAL DRAWING.

   (a) The use of drafting instruments.

   (b) Projection of simple drawings.

   (c) Reading of drawings.

3. WOOD WORK.

   (a) Identification of woods, particularly those used in aircraft structure.

   (b) Inspection of woods for aircraft use for airworthiness and causes for rejection.

   (c) Structure of woods.

   (d) Drying and storing of woods.

   (e) Steaming and bending of woods.

   (f) Veneer, laminated wood and plywood.

   (g) Gluing of wood.

   (h) Kinds of glue, their preparation and when each is used.

(i) Grain, annular rings, knots, pitchpockets, compression wood, decayed and warped wood; when acceptable and rejected.

(j) Procedure to be followed in repair, splicing and gluing of wood joints. When and where acceptable.

(k) Assembly and testing of glued joints.

(l) Pressing and clamping, duration and measuring of pressure.

(m) Stressed wood covered fuselages, wings and control surfaces, inspection and repair of.

(n) Equipment and tools used in wood work, their use and care.

(o) Jigs, trammels, levels, protractors, etc. Purpose and use of each.

(p) Alignment, definition and how obtained in wood structure.

(q) Construction, maintenance, repair and replacement of wing spars, wing tips, leading edges, ribs, etc.

(r) Protective materials and finish, purpose, selection and application.

4. WELDED STEEL STRUCTURES AND FITTINGS.

(a) Identification of aircraft structural tubing.

(b) Properties of metals.

(c) Cutting, fitting, welding and fabrication of aircraft structural tubing and fittings from drawings.

(d) Protective materials and finish, purpose, selection and application, exterior and interior.

(e) Proper equipment and tools for cutting, fitting, aligning, and welding of tubular structures.

(f) Proper procedure used in common practice to replace or repair damaged steel tubular structure, including cluster joints and fittings.

(g) Fabrication, assembly and alignment of tubular structures, the use of jigs, trammels, levels and protractors.

(h) Warping caused by welding, cause, prevention and correction.

(i) Fabrication of steel fittings, cutting, forming, bending, welding; heat treating, locating and installation; procedure and precautions to be observed.

(j) Regulations pertaining to repair and replacement of damaged fittings.

(k) Marking of fittings for bending, as scratching with a sharp pointed instrument, etc., prohibited practice.

5. WELDING, RIVETING AND HEAT TREATING OF STEEL, STAINLESS STEEL, ALUMINUM AND ALUMINUM ALLOY, STRUCTURE, STOCK AND FITTINGS.

(a) Acetylene procedure and practice.

(b) Equipment, proper use and care for welding equipment.

(c) Limitations for use of electric welding.

(d) Care and selection of proper materials to be used in making all types of welded joints such as fluxes, welding rods, etc.

(e) All types of welded joints such as fillet welds, butt welds, spot welds, rosette welds, tack welds and angular welds.

(f) Preparation of materials for welding.

(g) Penetration and fusion of welds, hot, cold and burned welds, causes and prevention of.

(h) Visual inspection of welded joints, general appearance of satisfactory and unsatisfactory welds.

(i) Joints and Splices. Insert, sleeve, fishmouth, and angular.

(j) Warping, cause and prevention.

(k) Riveted joints and structures, fabrication of.

(l) Procedure to be used in riveting, selection and inspection of materials and causes for rejection.

(m) Rivets, heat treated and others, their identification, where used and limitations and precautions to be observed in the use of heat treated rivets.

(n) Cutting, forming, drilling, fitting and alignment for riveting.

(o) Rivets, heat treated, preparation, storage, care and use.

(p) Heat treating, purpose, procedure, types, methods, usage, application and identification of.

(q) Equipment for testing, as Rockwell or Brinell, use and care of.

(r) Types of heat treatment and where applicable.

(s) Repairs to heat treated structures, when permissible and re-heat treating.

6. ALUMINUM ALLOY STRUCTURE AND FITTINGS.

(a) Identification of aluminum and aluminum alloy materials.

(b) Fabrication of aluminum alloy structure and fittings.

(c) Cutting, fitting and fabrication of aircraft structure and fittings from drawings.

(d) Protective applications, purpose, selection, exterior and interior.

(e) Aluminum and aluminum alloy metal, properties, strength, usage and weight.

(f) Corrosion, causes and prevention and susceptibility of aluminum and its alloys to corrosion.

(g) Precautions and limitations, no permissible repair of aluminum alloy fittings.

(h) Heat treating of aluminum alloy fittings and structure.

(i) Precautions to be observed for aluminum alloy materials when attached to and in contact with certain other materials and metals.

(j) Equipment and tools necessary in the fabrication of aluminum alloy structure and fittings, their use and care.

(k) Repair and maintenance of cowling and cowl fastening.

(l) Cleaning of aluminum and aluminum alloys, care to be used in selection of materials for this purpose.

7. SHEET METAL, STEEL, STAINLESS STEEL, TERNEPLATE, ALUMINUM AND ALUMINUM ALLOY.

(a) Identification of sheet metal.

(b) Protective applications, their selection and use.

(c) Cutting, forming, bending and fitting, and fabrication of stressed skin metal covering.

(d) Repair and replacement of stressed skin metal covering.

(e) Manner and procedure of attaching to structure.

(f) Heat treated sheet metals, identification and use.

(g) Construction, repair and maintenance of fuel and oil tanks, and precautions to be observed in service and repair of fuel tanks.

(h) Floats and hulls, construction, repair and protective applications.

(i) Firewalls, installation, and regulations pertaining thereto.

(j) Cowling, fairing, streamlining, cowlings, etc.; installation, care, repair and inspection.

8. CONTROLS AND CONTROL SURFACES.

(a) Types of control systems, nomenclature and identification of controls and control-operating mechanism.

(b) Installation, rigging, operation, service, repair, adjustment and inspection of aircraft controls and control surfaces, including tabs with precautions to be observed in the installation and the rigging of tabs.

(c) Types of control surfaces.

9. MISCELLANEOUS.

(a) Approved control cables, splicing, approved splices, fabrication and inspection.

(b) Control cable service, care and replacement.

(c) Bonding; purpose, methods and material.

(d) Brazing and soldering, correct method of accomplishing and limitations of use in aircraft.

(e) Hydraulic and vacuum systems as applying to the actuation of controls, flaps, retractable landing gear, propellers, instruments, et cetera.

10. ELECTRICAL SYSTEM.

(a) Installation, bonding, conduits, materials to be used and precautions to be observed in installation.

(b) Lights and flares, installation, repair, maintenance and inspection.

(c) Batteries, battery boxes, drains, vents, cables, switches and connections.

(d) Lighting and ignition fuses, switches, their installation and inspection.

11. FUEL SYSTEM.

(a) Fuel line installation, annealing, bending; attachment, size and capacity, and precautions to be observed in installation.

(b) Hose connections, liners, clamps, strainer fittings, drains and control valves.

(c) Fuel tanks, installation, padding, ventilation, draining, cleaning, repairing and inspection.

(d) Gauges, caps and markings for content and capacity.

12. COVERING, FABRIC AND STRESSED SKIN.

(a) Identification of fabrics to be used for covering.

(b) Cutting and fitting.

(c) Thread, cord, tapes, selection, u and application of.

(d) Inspection before applying covering.

(e) Machine sewing, hand sewing, tacking, and ribstiching, spacing, etc.

(f) Inspection openings, location and number required.

(g) Application of protective materials, their selection and purpose served.

(h) Equipment required in the application of protective materials, use of same and precautions to be observed in applying.

(i) Location, dimension and regulations pertaining to the application of symbols and marks for the identification of aircraft, procedure to be followed in applying.

(j) Identification of stressed skin and materials used for covering.

(k) Cutting, fitting, and attachment to structure.

(l) Selection and application of protective materials.

13. LANDING GEAR ASSEMBLY.

(a) Types, fabrication, materials used and installation, maintenance, repair and inspection.

(b) Shock units, types, installation, maintenance, repair and inspection.

(c) Alignment.

(d) Brakes and controls, wheels, tires, etc.

14. ASSEMBLY AND RIGGING.

(a) Method and procedure, specifications applying and how obtained.

(b) Equipment, instruments and tools required, and their use.

(c) Procedure to be followed in rigging, corrections for faulty flight characteristics, effect of tabs, their installation and precautions to be observed.

(d) Procedure to be followed for the installation of floats and skis, regulation pertaining to selection of same for approved stressed load, etc.

(e) Propeller installation, tracking, periodic servicing.

15. INSTRUMENTS AND RADIO EQUIPMENT.

(a) Installation and inspection of two-way radio.

(b) Types of instruments, installation, purpose, correct reading in service, marking for limits of operation, actuation, etc.

16. AIRCRAFT APPLIANCES.

(a) Floats and skis, installation, materials used, maintenance, repair and inspection.

(b) Flares, installation, inspection and precautions to be observed in their installation, marking of controls, etc.

(c) Safety belts, regulations pertaining thereto, installation, testing and inspection.

(d) Cabin heaters, installation, repair and inspection.

17. INSPECTION OF CERTIFICATED AIRCRAFT.

(a) Manner of conducting a thorough and detailed inspection of a certificated aircraft.

(b) Types of inspection, by whom conducted, when required and records of same, periodic, for renewal of certificate, following repair or alteration.

(c) Use and preparation of Repair and Alteration forms following repairs or alterations, and other data, drawings, etc, which may be required.

ENGINE CURRICULUM

1. ENGINES, THEORY AND PRINCIPLE OF OPERATION.

   (a) The engine and its parts, nomenclature, etc.

   (b) The theory of operation of the 4-cycle engine.

   (c) Energy conversion to useful power, reciprocal to rotary motion.

   (d) Transmission of power, gears, gear reduction and ratio, etc.

   (e) Horsepower, meaning and how determined.

2. MECHANICAL DRAWING.

   Same as for aircraft.

3. OPERATION, OVERHAUL, REPAIR AND INSTALLATION.

   (a) Thorough instruction in starting, stopping, operation and trouble shooting as applying to aircraft engines.

   (b) Detailed procedure and practice in complete disassembly of engines.

   (c) Instructions and practice in the procedure of cleaning for inspection and inspection of engine parts.

   (d) Specifications and tolerances, limitations and how determined, where obtained.

   (e) Progressive steps and procedure to be used in proper assembly of an engine, valve and ignition timing, adjustments and tolerances used; method, procedure and verification of adjustments.

   (f) Checking and testing of an overhauled engine.

   (g) Instruments, equipment, and special tools required for the proper overhaul of an engine and for determining tolerances and wear, and the use of these instruments.

   (h) Instructions pertaining to the use of magnafluxing, its purpose, where used and procedure for use.

   (i) Parts most susceptible to wear and failure.

(j) Regulations pertaining to replacement parts, airworthiness, proof of conformity, etc., as applying to the overhaul of certificated aircraft engines.

(k) Regulations pertaining to welding of engine structural parts.

(l) Installation in aircraft including all connections and controls, precautions to be observed, etc.

(m) Cooling, types, purpose, means obtained, failures, service, repairs, and inspection.

4. CARBURETION

(a) Carburetion, theory and principle of.

(b) Carburetors, types, their construction and operation, repair, maintenance, adjustment and inspection.

(c) Effect on carburetion by variation in temperature, humidity, and atmospheric pressure.

(d) Induction systems, diffusers, blowers, and superchargers, types, construction and operation, purpose, maintenance, and repair, precautions in use of and inspection.

(e) Carburetor heaters and air mazes, purpose, construction, installation, operation, care and maintenance.

(f) Installation of carburetors. Procedure and precautions to be observed.

(g) Carburetor troubles and failures and corrective measures.

(h) Carburetor parts and nomenclature, and purpose of each.

5. ELECTRICAL APPLIANCES AND IGNITION

(a) Ignition system, theory of.

(b) Ignition, magneto and battery, single and dual, types of each, their construction, operation, maintenance, repair and inspection.

(c) Ignition systems, parts and nomenclature, location, construction, and purpose of each, common failures, causes and corrections.

(d) Boosters, types, purpose, location, installation, operation, grounding, and precautions in the use of.

(e) Ignition system, timing and synchronization, shielding and wiring.

(f) Starters, types, construction, installation, operation, maintenance, repair and inspection.

(g) Generators. Types, purpose, operation, installation, maintenance, repair and inspection.

(h) Batteries. Types, construction, installation, maintenance, and precautions to be observed in the installation and use of.

(i) Spark plugs. Types, hot and cold, high compression, etc., adjustment, maintenance, repair and inspection.

6. LUBRICATION

(a) Theory, purpose and history of lubrication.

(b) Oils and lubricants, types, grades and properties.

(c) Lubrication systems, dry and wet sump, splash and pressure.

(d) Pumps, types, installation, location, actuation, operation, construction, maintenance, repair and inspection.

(e) Lines, hose connection, tanks, drains, vents, filters, etc., their installation, care and inspection.

(f) Heating and cooling, radiators, lagging, etc. Installation, maintenance, repair and inspection.

(g) Pressure relief valves. Types, location, purpose, adjustments, maintenance, repair and inspection.

7. PROPELLERS

(a) Types, wood and metal, fixed, adjustable, controllable, automatic, feathering, etc.

(b) Diameter and pitch, ground and structure minimum clearance.

(c) RPM and HP rating, and limitations in use.

(d) Propeller, including hub and blade, identification data, location, etc.

(e) Maintenance and servicing of propellers, extent of and by whom to be made.

(f) Civil Air Regulations pertaining to modification, extent of and by whom to be made, including changes in markings.

(g) Theory of local etching and magnafluxing, procedure, purpose and extent.

(h) Tracking of propellers, purpose and procedure.

(i) Regulations pertaining to repairs to damaged wood propellers and metal propeller blades and hubs. Extent of repairs permissible and by whom to be made. Records, where recorded and by whom made. Ground for rejection.

(j) Propeller installation and proper fitting, changes in installation to reduce vibration.

(k) Equipment, tools and instruments necessary to properly adjust, service and make such repairs as are permissible, and the use and care of this equipment.

8. SHOP WORK, PRACTICE AND PROCEDURE

(a) Bench and shop equipment, instruments and hand tools, their use and care.

(b) Proper use and care of all tools, equipment, instruments, et cetera, as listed in Facilities, Equipment and Material prescribed for the use of, and required for the construction, maintenance, repair, overhaul and inspection, including the rigging of an aircraft and its appliances, and/or the construction, maintenance, operation, overhaul, repair and inspection of an aircraft engine and propeller and their appliances.

CIVIL AIR REGULATIONS

1. Proper instruction shall be provided in the following listed Parts of the Civil Air Regulations:

Parts 01, 02, 04, 13, 14, 15, 18, 24 and 52.

FACILITIES, EQUIPMENT, AND MATERIAL

A. A drafting room with drafting tables and equipment.

B. A stock room set up to insure the proper segregation of materials.

C. Suitable separate space, temporary or permanent structure, for doping, including proper ventilation and temperature control.

D. Suitable separate space equipped with wash tank and air pressure cleaning equipment.

E. Suitable separate space provided with test stands for running in engines.

F. Suitable separate space provided with the necessary tables and benches, instruments and equipment to disassemble, repair, assemble, test, service and inspect the following:

1. Ignition, electrical equipment and appliances.
2. Carburetors and fuel systems.
3. Hydraulic and vacuum systems as applying to the actuation of aircraft and engines and their appliances.

G. Suitable space including tables, benches, horses, tail stands, etc., for the disassembly, inspection, assembly, and rigging of an aircraft.

H. Various types of fuselages, wings, control surfaces, landing gear, engines, propellers and their appliances, including instruments, communication aids and electrical equipment and appliances. This equipment shall include various types of modern American made aircraft, engines and propellers. The propellers shall be of fixed type, wood and metal, and

adjustable and controllable metal. The engines shall include at least one opposed type, one in-line type, one radial type, one super charged type, and shall include at least one radial engine of not less than 350 horsepower. Also there shall be provided at least one modern type aircraft complete with engine, propeller, instruments, radio (two-way), landing lights, flares, and other items of equipment on which a mechanic might be required to work and with which he should be familiar.

The other various items of equipment, components, parts and appliances shall be of various types and makes, sufficiently diversified, to indicate the different manners of construction, assembly and operation when installed on an aircraft for use. (Note: The foregoing equipment is not required to be in an airworthy condition and may have been damaged, provided it has been repaired sufficiently for complete assembly.)

I. An adequate supply of power plant and flight instruments and two-way radio communication equipment and facilities to provide a means of giving proper instruction in the installation and checking of these items in actual use.

J. An adequate supply of raw materials which are used in the construction, maintenance, repair and overhaul of aircraft, such as steel tubing, sheet metals, wood, rivets, bolts, pins, fabric, dope, glue, etc.

K. The following tools and miscellaneous items, the quantity to be governed by the number of students enrolled, shall be sufficient to assure each and every student of proper instruction in their purpose, use, and care:

1. Bench and shop, hand tools.

2. Micrometers, inside and outside.

3. Protractor and level.

4. Surface plates.

5. Trammel and plumb bob.

6. Mandrels, sufficient in number and size to provide for adequate instruction in their use.

7. V-blocks and truing stand.

8. Buffers, one of which shall be portable.

9. Emery wheels.

10. Spray gun.

11. Sewing machine, suitable for sewing aircraft covering.

12. Press and portable drills.

13. Band and rip saws.

14. Lathe

15. Planer or joiner for woodworking.

16. Welding equipment with proper assortment of torch tips and supplies.

17. Cutting and forming tools.

18. Benches, vises, saw horses, and step ladders.

19. Soldering equipment.

20. Brazing equipment.

21. Sanding machine.

22. Sand blasting equipment.

23. Bending and forming tools and equipment.

24. Air rivet hammer with controls and indicator.

25. Heat treating equipment for rivets and small structural parts.

26. Equipment for applying, and material to be used, for protective purposes and finish, on metal, wood, and fabric.

27. Cable splicing equipment.

28. Magnifying glasses of at least 4-6 power.

29. Suitable equipment for annealing and bending fuel and oil lines.

30. Steel tape at least 50 feet long.

31. Suitable equipment for localized etching of propellers.

32. Suitable equipment for measuring pitch angles.

33. No-go gauge, one for use on propeller splines and one for measurement of tolerances, as for valve guides, etc.

34. Suitable equipment for steaming and bending of aircraft wood.

35. Suitable equipment for making glued, wood joints.

36. Suitable equipment for testing glued joints.

37. Suitable equipment for testing hardness of metals as Rockwell or Brinnel, or other equipment satisfactory to the Authority.

38. Air Compressor, with pertinent attachments and supplies.

39. Suitable space, tables, engine stands and special tools required for disassembly, inspection, assembly, and timing of engines, including reamers, taps, valve grinding tools, valve seat cutters, and the like.

40. Block and tackle equipment, or portable crane, satisfactory to the Authority.

41. Propeller hub puller.

42. Equipment for checking alignment of crankshaft, master rods, and connecting rods which is satisfactory to the Authority.

43. High pressure spark plug testing machine.

44. Spline adapter and stand.

45. Adequate glue presses or clamps.

46. Wood propeller tipping material.

47. Scrapers, wood and riffle files, and tin snips or metal shears.

48. Blow torch and heating torch.

49. Batteries and sufficient equipment to give instruction in testing and charging of batteries.

The tools and shop equipment described herein shall be in a satisfactory working condition and shall be of a type and design proper for the purpose for which each is to be used. All instruments, testing equipment, and special equipment required for testing, servicing and overhauling aircraft, engines, propellers, electrical equipment and their appliances as specified herein shall be in a satisfactory working condition and shall be of a type and design proper for the purpose for which each is to be used, and satisfactory to the Authority.

Units of equipment on which instruction is to be given and on which practical experience is to be obtained in shop practice, such as aircraft, engines, propellers, appliances, electrical units, and the like, shall be provided in sufficient number to assure that all students shall receive such experience and instruction thereon as is indicated in the school curriculum, with not more than eight students working on any single unit at any one time.