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Developing an Aircraft Maintenance Curriculum
UNIVERSITY OF ILLINOIS INSTITUTE OF AVIATION

Leslie A. Bryan, Ph.D., LL.B., Director  James M. Hancock, A.B., Editor

UNIVERSITY OF ILLINOIS BULLETIN

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by LESLIE A. BRYAN

Director, Institute of Aviation
University of Illinois

Developing an Aircraft Maintenance Curriculum
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The University of Illinois has been actively interested in aviation for a long period of time dating at least from World War I. During World War II that interest increased and culminated in the establishment of the Institute of Aviation in 1945 which, among its various activities, conducts aeronautical research, flight training, and subprofessional technical aviation courses for students of the University.

The Link Foundation, recognizing the pioneering experience of the Institute of Aviation, provided a grant to the University of Illinois Foundation for use by the Institute in order to prepare and publish information about its program, believing that the compilation of this information might be valuable to other institutions and to other segments of the aviation industry considering the establishment of similar activities.

This bulletin, the third of five such publications, attempts to give the basic information necessary to organize and operate an aircraft and engine maintenance curriculum. Other bulletins published under The Link Foundation grant cover the organization of a flight training curriculum, the operation of a university airport, including essential facts and figures about repair and maintenance services, the organization of an aviation ground school, and the organization of an aircraft repair and maintenance unit. While the aim has been to provide sources of general information, there is frequent reference to the operations of the University of Illinois' aviation program for illustrative purposes.

In the preparation of the material for this bulletin, Mr. Edward A. Cushman, Instructor in charge of the Aircraft Maintenance Curriculum of the Institute of Aviation, has been most helpful.

In this monograph, as in all publications of the Institute, the author has had complete freedom to express his opinions, with the understanding that he will assume sole responsibility therefor.

November, 1954

Leslie A. Bryan, Director
An Aircraft Maintenance Curriculum, a two-year junior college terminal course, is a part of the activities of the Institute of Aviation. This curriculum prepares students for the C.A.A. Airframe and Power-plant rating and also for the Private Pilot rating. The curriculum gives concentrated study in the field of aircraft maintenance. It trains students to be resourceful in the performance of efficient aircraft maintenance. The course aims to instill into the students the proper attitudes of responsibility and citizenship toward the aeronautical industry and to the country and community in which they live. The Airframe and Power-plant curriculums as taught at the University of Illinois are outlined in the appendix.

The basic guide used in developing a curriculum of this type, for which federal approval is desired, is the Civil Aeronautics Administration (C.A.A.) Manual 53. This manual, entitled Mechanics School Certificates, can be purchased from the Superintendent of Documents, Washington 25, D.C., for $1.

Manual 53 requires a (1) Mechanics School Application and Inspection Report, (2) four copies of the proposed curriculum, (3) four copies of a list of facilities and equipment, (4) and four lists of instructors showing their qualifications for instructing in aviation subjects.
MECHANICS SCHOOL APPLICATION AND INSPECTION FORM

The Application and Inspection Report (Form ACA-614) is furnished by the appropriate district agent of the C.A.A. It is a one page form and constitutes a summary of the requirements for curriculum, space, equipment, facilities, forms, supplies, heating, lighting, staff, and proposed enrollment.

It is desirable to indicate on Form ACA-614 that approval is requested for airframe, powerplants, and combined airframe and powerplant curriculums, since thereby duplicate instruction in the basic courses can be eliminated. The basic courses need to be taught the student only once although the basic courses must be completed before a student may attempt the C.A.A. written examination for either the powerplant or the airframe rating.

The proposed curriculum, which must follow Manual 53, specifically states the minimum hours of study required in all subject fields. These subject fields are broken into three categories, i.e.:

1. Basic courses required in both Airframe and Powerplant Curriculum
2. Airframe Curriculum
3. Powerplant Curriculum

Powerplant students learning the proper use of shop tools.
BASIC COURSES

The basic courses consist of mathematics, physics, theory of flight, nomenclature of aircraft, weight and balance, shop practice, drafting, mechanics ethics, and proper methods of using C.A.A. documents and forms. The basic courses total 330 hours.

AIRFRAME CURRICULUM

The Airframe Curriculum courses require a total of 960 hours of lecture and shop work. This total includes the basic courses, and in addition, classes in woodwork, sheet metal and welding, fabric covering and finishing, fuel systems, landing gear assembly, hydraulic and pneumatic systems, aircraft electrical systems, radio installation and inspection, instrument installation and inspection, assembly and rigging, control cables and surfaces, aircraft appliances, and inspection of certificated aircraft. A maximum of 40 per cent, or 384 hours, of this curriculum may be lecture. The remaining 576 hours are laboratory work and basic courses.

POWERPLANT CURRICULUM

The Powerplant Curriculum course requires 960 hours of lecture and shop work, including the basic courses. No more than 40 per cent, or 384 hours, may be classroom lectures. The requirements for the Powerplant Curriculum, found in section 53, 41-1 of Manual 53, include the basic courses plus classes in powerplant overhaul and operation, carburetion, electrical systems and accessories, lubrication, and propellers.

Class Schedules

ROTATING SCHEDULES

Scheduling classes is a major problem if part of the Aircraft Maintenance Curriculum classes meet on the campus and part at the airport. At the University of Illinois the majority of the Aircraft Maintenance Curriculum classes are held at the University of Illinois Airport, which is located six miles from the campus. Experience has indicated that by scheduling the courses given on the campus from 8:00 a.m. to 10:00 a.m. the classes at the airport can be handled from 10:20 a.m. to 4:20 p.m.

By setting up a rotating class schedule each instructor is able to instruct a class of fourteen to sixteen students. This rotation process permits the student to spend twenty hours a week for five weeks in a given subject. He then progresses to another class for five weeks, thus enabling an instructor to teach three different groups of fourteen to sixteen students during the morning hours of each semester.
Airframe students making repairs to an aircraft wing.

Students working on internal combustion engines.
The same rotating schedule is followed in the afternoon. Of the technical courses given at the University Airport, the powerplant courses are taught during the morning and the airframe classes during the afternoon. This schedule helps to eliminate the overloading of classrooms and laboratory areas and at the same time allows greater utilization of equipment.

An instructor who teaches during the morning is assigned one or possibly two classes in the afternoon for one hour, three days a week. This practice is reversed for an instructor who teaches class in the afternoon.

**Student Qualifications**

**HIGH SCHOOL CREDITS**

The Institute of Aviation requires a student to have a graduation certificate from an accredited high school. The student must have also completed 15 units of work, of which three units must be in English, one unit in algebra, and one unit in geometry. The Director of Admissions and Records handles the admission applications and applies the same rules for admission to the Institute of Aviation as apply generally throughout the University.

**PRIVATE PILOT'S LICENSE**

All students in the Aircraft Maintenance Curriculum are required to acquire a Private Pilot's Certificate. A mechanic should have first-hand knowledge of the problems and techniques of flight. A Private Pilot's rating also gives the mechanic a greater appreciation for the necessity of good maintenance.

Students who have morning classes at the airport have time for flight courses and for the classes held on the campus in the afternoon, and those students having airport classes in the afternoon have classes on campus or take extra flight classes in the morning. This arrangement of classes makes it possible for a student to take additional elective work in flight training. Many aircraft maintenance students receive their Commercial Pilot's rating in addition to their Airframe and Powerplant Certificate.

**ESTIMATED EXPENSES**

Estimated expenses for aircraft maintenance students, excluding such variable items as clothing, railroad fare, and recreation are given in the accompanying tabulation. This estimate covers two semesters for students
who are residents of Illinois. For those who are *not residents* of Illinois the yearly tuition is $350.

There is also an extra fee of $275 to cover the cost of the required Private Pilot Course given during the first year. Additional flight courses can be elected at a cost of $275 per course.

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<thead>
<tr>
<th></th>
<th>Minimum Budget</th>
<th>Moderate Budget</th>
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<tr>
<td>Tuition and fees</td>
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<tr>
<td>Textbooks</td>
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<tr>
<td>School supplies</td>
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<tr>
<td>Room and Board (figured for nine months)</td>
<td>585</td>
<td>720</td>
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<tr>
<td>Laundry (mailed home)</td>
<td>20</td>
<td>20</td>
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<tr>
<td>Tool Kit (Engine)</td>
<td>70</td>
<td>80</td>
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<tr>
<td>Two Pairs Coveralls</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td><strong>Total Cost (residents of Illinois)</strong></td>
<td><strong>$960</strong></td>
<td><strong>$1170</strong></td>
</tr>
</tbody>
</table>

A "Prop Lab" lecture on propellors.
Instructor Qualifications

C.A.A. REQUIREMENTS

The C.A.A. requires applicant institutions to have an adequate number of instructors, holding appropriate mechanic certificates and ratings, to provide the necessary instruction and supervision of students. Mathematics, physics, drawing, etc., i.e., the basic courses, may be taught by any qualified person without being certified by the C.A.A.

An additional federal qualification is that the staff must maintain a level of instruction which will permit 80 per cent of the students who apply for a mechanics certificate within 60 days after graduation to receive that certificate by passing a three-hour written examination, an eight-hour practical examination, and a one-hour oral examination. These examinations are given by representatives of the C.A.A. As soon as all tests have been passed the C.A.A. records the result in Washington, D.C., and the certificate is awarded.

UNIVERSITY REQUIREMENTS

Staff requirements in the Aircraft Maintenance Curriculum are also governed by the rules of the University of Illinois Board of Trustees. To be appointed to the aircraft maintenance staff each applicant must have at least a bachelor's degree. Men with an Industrial Education or Aero Engineering background are usually well prepared to teach in an aviation maintenance curriculum.

Facility and Space Requirements

FACILITY REQUIREMENTS

Requirements for facilities, equipment, and material, as stated in Manual 53, are general standards which must be met by each applicant. The type and the amount of such facilities, equipment, and materials are determined by the requirements of the particular rating and by the maximum number of students expected to be in attendance at a particular time.

The facilities and equipment required by Manual 53 are not adequate to prepare students for special ratings in instrument, propeller, radio, or accessory repair since all work performed on the aircraft, other than airframe and powerplants, is to be performed by a certificated repair station, the manufacturer, or a certificated air carrier. The certificated repair station, air carrier, or manufacturer provides, therefore, the training facilities necessary to prepare mechanics in the special fields noted.
SPACE REQUIREMENTS

When an application for a maintenance curriculum approval is submitted, a representative of the C.A.A. will make an inspection. This representative will determine whether the applicant has the necessary space, and whether it is properly heated, lighted, and ventilated.

The Institute of Aviation currently meets the C.A.A. space requirements with the following facilities:

A. Drafting room and tables. 1500 sq. ft.

B. A stockroom, used concurrently with the Aircraft Maintenance Department for new supplies. The curriculum also maintains small supply rooms in each laboratory for used and surplus school supplies. 800 sq. ft

C. A dope room, used concurrently with the Aircraft Maintenance Department for fabric work, painting, and finishing. 1200 sq. ft

D. A ventilated engine cleaning space. 200 sq. ft

E. Space for testing engines is provided by portable run-up stands. 1200 sq. ft

F. 1. The accessories laboratory has space for instruction, disassembly, and inspection of magnetos, carburetors, starters, spark plugs, and ignition systems. 1200 sq. ft

2. The instruction on hydraulic and vacuum systems is held in a shop area which provides space for hydraulic mock-ups, etc. The space is used alternately for shop practice courses and hydraulics. 1200 sq. ft

G. Space for classes in disassembly, inspection, woodworking, assembly, and rigging of aircraft. 1200 sq. ft

H. The engine laboratory houses four portable run-in stands, eight disassembly and assembly bays with parts rack, overhaul stand and work bench, an inspection area, three large engine mock-ups, a cleaning area, and a small lecture area. 2200 sq. ft

I. The propeller laboratory provides space for the disassembly of six Hamilton standard hydromatic three blade propellers at one time. Also, space is provided for storage of those and other propellers of comparable size, plus ten wood props, and twelve con-
trollable pitch propellers. This laboratory is an approved propeller repair station.

J. The sheet metal and welding area are combined, due to the close association of the work in sheet metal and welding. There are fourteen welding stations and equipment for sheet metal work which will accommodate fourteen students.

K. In addition to the above space there are:
   1. Facilities for five instructors and a clerk-stenographer
   2. A small reference library
   3. One large classroom for lectures and visual aids
   4. Two locker rooms, each of which accommodates 40 students

   Total area is

   2280 sq. ft.
   900 sq. ft.
   422 sq. ft.
   364 sq. ft.
   936 sq. ft.
   950 sq. ft.

   15,352 sq. ft.

Equipment Requirements

MINIMUM C.A.A. STANDARDS

When making application for an A and P school certificate, the applicant must have enough airplanes, powerplants, propellers, appliances, and components of various kinds to insure that every student will get adequate training on each unit.

Manual 53, Part 25-1 states the following as minimum requirements for instructional equipment:

“1. Modern type aircraft, of a type currently certificated by the C.A.A. complete with retractable landing gear, wing flaps and radio. (Mock-ups for hydraulics may be used if the airplane is not equipped with such.)

“2. Various types of fuselages, wings, control surfaces, landing gear, radios, instruments, propellers (including fixed pitch wood and metal, adjustable and controllable metal), aircraft engines of the opposed, inline and radial type — one of which must be at least 350 h.p. and one supercharged type.

“3. A variety of magnetos, starters, generators, carburetors, regulators, spark plugs, landing lights, flares and other components.”

This equipment need not be new. The Institute of Aviation has found that old or used equipment presents a practical maintenance problem to be worked out by students and is less expensive as well.
EXPENDABLE EQUIPMENT

Approximately $2,000 per year is used for expendable supplies and equipment. With this, the Aircraft Maintenance Curriculum is able to replace broken or malfunctioning units and also to buy some new items each year, besides maintaining the supplies of plywood, acetylene, oxygen welding rod, solvent, welding materials, solder, oil, electrical supplies, etc., which are expendable materials used in laboratory work.

The estimated cost per student each year for general operation and expendable materials is $30. This includes material used by the student such as: cotter pins, safety wire, nuts, screws, bolts, masking tape, oil and gasoline for running engines, fabric, dope, thinner, welding supplies, cleaning fluids, etc.

SURPLUS PROPERTY

To meet Aircraft Maintenance Curriculum needs as enrollment increases, the Institute of Aviation maintains close liaison with the Surplus Property Agency of the State Department of Education. All listings of government surplus property in this area pass through that office. The Institute of Aviation has bought many needed items at a cost of one per cent of the original acquisition cost, plus packing, handling, and transportation. By contacting Wright Field, Chanute Field, and Ordnance Depots, the Institute of Aviation has acquired a quantity of equipment and supplies that would have been impossible to obtain had it been necessary to purchase them as new equipment.

The surplus property program has now been established as a permanent Federal Government operation. This surplus is available to all tax-supported institutions. Contact for surplus property is made through the State Department of Public Instruction. Many of the items may need repair but this cost factor is nominal compared to new prices for the same equipment.

The amount of tools and shop equipment will be governed by the number of students enrolled. There must be sufficient equipment to assure that each student has the proper instruction in the construction, maintenance, and repair of an aircraft. The equipment and tools may be selected according to the rating sought and the requirements of the curriculum.
Appendixes
Appendix A

The expenses listed for establishing an aircraft and powerplant curriculum are basic. The Institute of Aviation, in some instances, is equipped as shown. In most instances the Institute exceeds what is shown. This has been made possible by using the surplus donation program of the Federal Government.

The following listings are given as being adequate for a class of 14 students. The prices quoted are the average between highest and lowest 1954 priced articles.

A. Airframe rating

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price per Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 2 sets of trammels</td>
<td>$2.50</td>
<td>$5.00</td>
</tr>
<tr>
<td>2. 4 sand or shot bags — 5 lb. (sand)</td>
<td>$1.00</td>
<td>$4.00</td>
</tr>
<tr>
<td>3. 5 work benches — wood for sheet metal</td>
<td>$50.00</td>
<td>$250.00</td>
</tr>
<tr>
<td>4. 14 wood horses for work on wings</td>
<td>$5.00</td>
<td>$70.00</td>
</tr>
<tr>
<td>5. 4 wing racks for storage of wings</td>
<td>$15.00</td>
<td>$60.00</td>
</tr>
<tr>
<td>6. 2 six-foot step ladders</td>
<td>$25.00</td>
<td>$50.00</td>
</tr>
<tr>
<td>7. 2 sets tire tools</td>
<td>$15.00</td>
<td>$30.00</td>
</tr>
<tr>
<td>8. 2 plumb bobs</td>
<td>$1.50</td>
<td>$3.00</td>
</tr>
<tr>
<td>9. 2 levels</td>
<td>$5.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>10. 2 straight edges</td>
<td>$2.50</td>
<td>$5.00</td>
</tr>
<tr>
<td>11. 2 sets of scales for weighing — 0 to 2,000 lb.</td>
<td>$150.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>12. 1 tail wheel scale — 0 to 500 lb.</td>
<td>$50.00</td>
<td>$50.00</td>
</tr>
<tr>
<td>13. 2 aircraft jacks</td>
<td>$145.00</td>
<td>$290.00</td>
</tr>
<tr>
<td>14. 6 spray guns with hose</td>
<td>$45.00</td>
<td>$270.00</td>
</tr>
<tr>
<td>15. 3 airpressure regulators</td>
<td>$25.00</td>
<td>$75.00</td>
</tr>
<tr>
<td>16. 1 hand saw</td>
<td>$3.50</td>
<td>$3.50</td>
</tr>
<tr>
<td>17. 4 7&quot; block planes</td>
<td>$4.00</td>
<td>$16.00</td>
</tr>
<tr>
<td>18. 1 set wood chisels (6)</td>
<td>$6.00</td>
<td>$6.00</td>
</tr>
<tr>
<td>19. 1 miter saw and box</td>
<td>$30.00</td>
<td>$30.00</td>
</tr>
<tr>
<td>20. 1 table saw and jointer</td>
<td>$146.00</td>
<td>$146.00</td>
</tr>
<tr>
<td>21. 1 band saw — 14&quot; metal and wood</td>
<td>$112.00</td>
<td>$112.00</td>
</tr>
<tr>
<td>22. 1 electric sander</td>
<td>$49.50</td>
<td>$49.50</td>
</tr>
</tbody>
</table>
23. 1 brace and bit @ 15.00 15.00
24. 1 carpenter’s square @ 2.00 2.00
25. Cabinet maker’s clamps — 3 dozen:
   12 3” opening per dozen @ 18.00 18.00
   12 6” opening per dozen @ 24.00 24.00
   12 12” opening per dozen @ 36.00 36.00
26. G clamps — 4 dozen:
   24 2” opening @ 1.50 36.00
   24 4” opening @ 2.20 52.80
27. 6 paint brushes — 4” @ 6.00 36.00
28. Fabric sewing needles — 1 set @ 15.00 15.00
29. 2 sewing machines — heavy duty @ 400.00 800.00
30. 1 fabric table 4’ x 8’ — can be made for @ 50.00 50.00
31. Pinking shears — 3 pair @ 6.00 18.00
32. Number and letter templates — 1 pr. @ 8.50 8.50
33. Plastic and upholstery repair equipment @ 15.00 15.00
34. Control balancing jig
35. Welding equipment as follows:
   14 welding tables and fire brick @ 12.00 168.00
   1 welding manifold @ 150.00 150.00
   14 welding outfits with tips @ 60.00 840.00
   14 steel stools — 24” @ 1.70 23.80
36. Sheet metal kits and equipment as follows:
   14 air drills @ 35.00 490.00
   14 riveting guns @ 35.00 490.00
   14 cleco guns @ 1.50 21.00
   14 bucking bars @ 3.00 42.00
   42 assorted riveting heads @ 1.50 63.00
   100 assorted cleco fasteners @ .10 10.00
   14 machinists’ vises — 4” jaw @ 15.00 210.00
37. Metal shear, open throat — 42” bed @ 650.00 650.00
38. Metal brake and folder — 42” wide @ 165.00 165.00

**TOTAL**  $6,304.10
B. Powerplant rating

1. Cleaning and degreasing equipment  
   @ $500.00 $500.00

2. Special engine tools (as required):
   - Small engines, per set
     @ 250.00 250.00
   - 350 hp — per set
     @ 850.00 850.00

3. 2 sets easy outs  
   @ 4.00 8.00

4. 4 torque wrenches  
   @ 15.00 60.00

5. 6 sets of feeler gauges  
   @ 1.50 9.00

6. Plug and thread gauges — 2 each  
   @ 1.50 6.00

7. Surface Plate  
   @ 25.00 25.00

8. Vee blocks — 1 pr.  
   @ 25.00 25.00

9. Engine parts inspection bench — 6 each  
   @ 50.00 300.00
   - Engine parts racks — 6 each  
     @ 35.00 210.00
   - Engine overhaul stands — 6 each  
     @ 75.00 450.00

10. Valve spring compression gauge  
    @ 85.00 85.00

11. 2 valve grinding and lapping equipment  
    @ 350.00 700.00

12. 2 valve and ignition timing tools — time-rite  
    @ 45.00 90.00

13. High tension ignition harness tester  
    @ 45.00 45.00

14. Engine accessory test equipment  
    (bench check) optional  
    @ 300.00 300.00

15. 2 engine test stands (stationary or mobile) self-erected  
    @ 300.00 600.00

16. 2 test clubs and propeller installation tools  
    @ 50.00 100.00

17. Propeller lubricating equipment  
    @ 7.50 7.50

18. 2 blade turning bars  
    @ 5.00 10.00

19. Propeller protractor  
    @ 35.00 35.00

20. Etching equipment  
    @ 5.00 5.00

21. Propeller spline, go and no-go gauges — optional  
    @ 75.00 75.00

22. Balance stand and mandrels for propellers  
    @ 250.00 250.00

23. 1 set of telescoping gauges  
    @ 16.50 16.50

24. Micrometers as follows:
   - Two 2" range  
     @ 6.75 13.50
   - Two 3" range  
     @ 7.50 15.00
   - Two 4" range  
     @ 9.00 18.00
   - Two 6" range  
     @ 10.50 21.00

25. Dial test indicator set  
    @ 13.50 13.50

26. 4 sets inside calipers  
    @ 2.00 8.00

27. 2 inside micrometer sets — 1" to 8"  
    @ 20.00 80.00

TOTAL  
$5,181.00
C. Miscellaneous equipment applicable to either airframe or power-plant rating

1. 3 bench grinders @ 40.00 120.00
2. 3 drill presses @ 75.00 225.00
3. Assorted hand tools (special wrenches, reamers, etc.) will vary in many ways — estimated @ 300.00 300.00
4. 4 magnifying glasses (8 to 10 power) @ 12.00 48.00
5. Fluorescent magnetic particle or similar inspection facilities available for instruction (on or off premises) @ 750.00 750.00
6. 3 lathes, metal turning bench type 10" @ 250.00 750.00
7. Hand drill (powered) with assorted drills (as required) 1/2" chuck @ 65.00 65.00
8. Bench arbor press @ 65.00 65.00
9. Tube fabrication equipment — benders and cutters — 2 @ 7.50 15.00
10. Soldering equipment — 6 irons @ 12.50 75.00
11. 6 combination squares and bubble protractors @ 3.00 18.00
12. 2 chain hoists @ 90.00 180.00
13. Lubrication equipment — 2 each — grease guns @ 8.50 17.00
14. Steel tape (50 feet) @ 5.00 5.00
15. Taps and dies, assorted sizes (as required) 1 set NF and NC combined @ 50.00 50.00
16. Assorted “C” clamps — listed under aircraft
17. Inside and outside micrometers — listed under engines
18. Wire strippers — 4 each @ 2.50 10.00
19. Electrical accessory test bench — magneto and generator @ 850.00 850.00
20. Volt-ohmmeter — 2 @ 35.00 70.00
21. Air compressor — 50 to 75 cfm @ 650.00 650.00
22. Battery charger — tungar type — 32 cell capacity with tester and other equipment @ 75.00 75.00

TOTAL $4,338.00

SIC EXPENDITURES FOR AN AIRFRAME AND POWERPLANT CURRICULUM

<table>
<thead>
<tr>
<th>Airframe Curriculum</th>
<th>$6,304.10</th>
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<tr>
<td>Powerplant Curriculum</td>
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</tr>
<tr>
<td>Miscellaneous Equipment</td>
<td>4,338.00</td>
</tr>
</tbody>
</table>

TOTAL $15,823.10
Appendix B
AVIATION 150 — AIRCRAFT ENGINE OVERHAUL

Ground Training — 100 classroom hours

I. Preparation and Study of Procedures
   A. Overhaul manual
   B. Equipment and tools

II. Removal of Propeller

III. Disconnect All Lines and Connections

IV. Removal of Engine from Aircraft

V. Removal of Accessories

VI. Disassembly of Engine into Major Subassemblies

VII. Disassembly of Major Subassemblies

VIII. Cleaning, Degreasing, and Decarbonizing

IX. Inspection of All the Parts
   A. Visual inspection
   B. Physical inspection with precision tools
   C. Magnaflux inspection of all ferrous parts
   D. Record all data on engine inspection record

X. Repair and Assembly into Major Subassemblies
   A. Remove and replace worn bushings and bearings
   B. Grind valves and valve seats and lap together
   C. Replace all piston rings
   D. Check all tolerances and clearances
   E. Paint crankcase, cylinders, etc.

XI. Final Assembly of Major Assembly
   A. Check all fits and clearances
   B. Check all runouts and tolerances
   C. Time valves to crankshaft
   D. Install pistons and cylinders
   E. Install new gaskets

XII. Installation of Accessories, Timing, etc.
   A. Adjust valve clearances
   B. Time ignition system
   C. Install starter, generator, carburetor, etc.

XIII. Installation and Run Up of Engine in the Airplane
   A. Install engine in airplane
   B. Install propeller
   C. Pre-oil engine
   D. Test engine according to manufacturer’s specification
   E. Log of engine test
   F. Sign off engine in log book and operations record
   G. Fill out C.A.A. form 337 if a major repair
Appendix C

AVIATION 151 — APPLIED AIRCRAFT PHYSICS

Ground Training — 45 classroom hours

I. Measurements
   A. English and metric systems
   B. Fundamental units

II. Matter — Effects of molecular forces and solids, liquids, and gases

III. Forces
   A. Gravitation and measurement
   B. Pressure and total force

IV. Fluids
   A. Buoyancy and specific gravity
   B. The atmosphere — its pressure and behavior
   C. Pneumatic devices and appliances

V. The Motion of Bodies
   A. Balanced and unbalanced forces
   B. Bodies in motion
   C. Newton’s laws of motion

VI. Work and Machines
   A. Principles of work
   B. Laws and applications of machines

VII. The Nature of Heat
   A. Thermometry and expansion
   B. Transmission of heat

VIII. Transformation of Heat Energy
   A. Heat measurement
   B. Humidity and engines

IX. Introduction to Electricity
   A. Magnetism
   B. Static electricity

X. Fundamentals of Current Electricity
   A. Current electricity
   B. Electric power and energy

XI. Effects of Electricity
   A. Magnetic action of electricity
   B. Heating and chemical action of electricity
   C. Electromagnetic induction
Appendix D
AVIATION 152 — AIRCRAFT ENGINE ACCESSORY OVERHAUL

Ground Training — 100 classroom hours

I. Carburetion, Fuel Injection and Supercharging
   A. Function of a carburetor and its units
   B. Fuel-air ratios, range of operation, etc.
   C. Principles of operation of a float-type carburetor
   D. Carburetor accessories
   E. The NAR series carburetors (Stromberg)
   F. The MA 4 carburetor (Marvel-Schebler)
   G. Principles of operation of diaphragm and pressure injection type carburetors
   H. Pressure carburetor accessories
   I. The PD series carburetors
   J. Fuel injection systems used on light aircraft engines
   K. Superchargers
   L. The G. E. turbo supercharger

II. Ignition Systems, Starters and Generators
   A. Ignition systems
   B. Principles of operation of aircraft magnetos
   C. The Scintilla magneto (AG and MN series)
   D. The Bendix-Scintilla magneto (SB 9R-N)
   E. Compensated Cam (Even Firing) magnetos
   F. The American-Boesch magneto (SF14R-U)
   G. Single unit dual-magneto ignition Scintilla (DB)
   H. Battery ignition systems
   I. Ignition switches
   J. Starting aids
   K. Time magneto and battery distributor to Jacobs L4MB Engine
   L. Ignition system wiring
   M. Spark plugs
   N. Types of starting systems
   O. Inertia type starters
   P. Principles of operation of direct cranking hand and inertia type starter
   Q. Generators — battery charging system
   R. Eclipse type generator
S. Voltage regulators
T. Current limitors
U. Reverse current cut-outs
V. 24-volt aircraft batteries

III. Fuel Pumps and Strainers
   A. Engine fuel pumps
   B. Booster fuel pumps
   C. Main strainers
   D. Finger strainers
   E. Primers
   F. Selector valves
   G. Cross over valves

IV. Oil Pumps and Strainers and Coolers
   A. Gear type pumps
   B. Thermostatic valves
   C. Oil cleaners
   D. Oil coolers

Appendix E

AVIATION 153 — AIRCRAFT SHOP PRACTICE

Round Training — 45 classroom hours

I. Bench and Shop Equipment — Instruments and hand tools; their care and use

II. Proper Use and Care of All Tools, Equipment, Instruments
   A. Hand tools — wrenches, screwdrivers, chisels, etc.
   B. Micrometers, vernier gauges, dial gauges, and cylinder gauges
   C. Use of hack saws; sawing with reference to blades
   D. Use of cold chisels
   E. Files and filing
   F. Soldering
   G. Drills and drilling operations
   H. Reamers, straight and tapered
   I. Taps and dies
   J. Abrasives and grinding wheels
   K. Lathes and cutting tools
Ground Training — 100 classroom hours

I. Equipment — Tools and instruments necessary to properly adjust, service, and repair propellers

II. Fixed Pitch Wood Propellers
   A. Method of construction
   B. Removal
   C. Inspection and maintenance service
   D. Minor repair, refinishing, and balancing
   E. Installation
   F. Check propeller track
   G. C.A.R. concerning wood propellers

III. Ground Adjustable Propellers
   A. Construction and operation principles
   B. Removal and disassembly
   C. Inspection
   D. Minor repair and maintenance service
   E. Reassembly and adjustment of blade angle
   F. Installation
   G. Check balance and track
   H. C.A.R. concerning metal propellers

IV. Hamilton Standard Controllable Pitch and Constant Speed Propellers
   A. Constructive and operative principles
   B. Removal and disassembly of propeller
   C. Local etching
   D. Inspection, reassembly, and installation
   E. Minor repair and maintenance
   F. C.A.R. concerning minor repair of metal propellers

V. Hamilton Hydromatic Constant Speed Full-Feathering Propellers
   A. Construction and operation principles
   B. Propeller governor operation principles and adjustments
   C. Removal of propeller
   D. Inspection and installation
   E. Minor repair and maintenance
   F. C.A.R. concerning major repair of metal propellers
VI. Curtiss Electric Constant Speed Propellers
   A. Construction and operation principles
   B. Governor operation principles and adjustments
   C. Removal of propeller
   D. Inspection and installation
   E. Minor repair and maintenance
   F. C.A.R. concerning rejection of metal propellers due to major defects

VIII. Aeroproducts Propeller
   A. Construction and operation principles
   B. Removal of propeller
   C. Inspection
   D. Installation of propeller

Appendix G

Aviation 155 — Aircraft Mathematics

Ground Training — 45 classroom hours

I. Fractions and Decimals
II. Decimal or Metric System and Conversions of Measures
III. Formulas
   A. Volumetric efficiency
   B. Thermo efficiency
   C. Mechanical efficiency
IV. Ratios and Proportions
V. Three Systems of Measuring Angles
   A. Sexagesimal system
   B. Centesimal system
   C. Radian or circular measure
VI. Horsepower Calculations
VII. Weight and Balance Problems
VIII. Shop Geometry
   A. Scales
   B. Relative velocities
Appendix H

AVIATION 157 — AIRCRAFT ENGINE THEORY AND PRACTICE

Ground Training — 300 classroom hours

I. Basic Fundamentals of Aircraft Engines
   A. Powerplant requirements and improvements
   B. Internal combustion processes
   C. Engine nomenclature

II. Principles of Operation and Construction
   A. Four stroke cycle, terms, and definitions
   B. Power output factors
   C. Cylinder arrangement and firing orders
   D. Crankshaft arrangement and nomenclature
   E. Connecting rod arrangement and construction
   F. Cylinder construction principles

III. Construction and Operational Principles
   A. Crankcase construction
   B. Pistons, piston rings, and their construction
   C. Propeller reduction gears and accessory gears
   D. Valve operation mechanism and valve timing
   E. Crankshaft construction and inspection

IV. Visual Inspection and Assembly Procedures
   A. Induction systems
   B. Assembly inspection procedures
   C. Tightening procedures, torque valves
   D. Valve timing check
   E. Installation of accessories

V. Ignition and Starting Systems
   A. Types of ignition systems
   B. Principles of magneto ignition and battery ignition
   C. Bench testing a magneto
   D. Timing magnetos to an engine
   E. Timing battery distributor to engine
   F. Spark plug maintenance
   G. Types of starters used
   H. Starting aids

VI. Maintenance Techniques
   A. Cleaning of parts
   B. Visual inspection
   C. Magnaflux inspection of ferrous parts
   D. Grinding of valves and valve seats
VII. Carburetion
   A. Functions of a carburetor
   B. Theory of correct carburetion and factors effecting its operation
   C. Carburetor units and their functions
   D. Induction systems
   E. Carburetor heaters and air filters
   F. Installation and adjustments

VIII. Propellers
   A. Types of propellers used on small engines
   B. Propeller nomenclature
   C. Airfoil theory of propellers
   D. Adjustable, controllable, and automatic propellers
   E. Maintenance and service of propellers
   F. Inspection
   G. Balancing and Tracking

IX. Fuels and Fuel Systems
   A. Classification and development of fuels
   B. Fuel tests
   C. Types of systems
   D. Units of fuel systems and their principles of operation
   E. Fuel transfer and crossfeed systems

X. Lubrication and Lubrication Systems
   A. Purpose and theory of correct lubrication
   B. Oils and lubricants
   C. Lubricating systems
   D. Oil consumption
   E. Units of an oil system and their principle of operation
   F. Maintenance of oil systems
Appendix I

AVIATION 158 — AIRCRAFT OVERHAUL

Ground Training — 135 classroom hours

I. Aircraft Disassembly
   A. Dismantling of monoplane or biplane
   B. Unit inspection of surfaces
   C. Inspection of structures
   D. Inspection of controls
   E. Inspection of systems

II. Repairs and Replacements
   A. Metal repair or alterations of tubular structures
   B. Sheet metal fabrication
   C. Wood repairs and finishing
   D. Controls
   E. System repairs or replacements
   F. Metal priming and finishing

III. Recovering and Finishing
   A. Material layout and cutting
   B. Sewing and stitching
   C. Doping and finishing
   D. Color mixing and lettering
   E. Soundproofing
   F. Upholstering
   G. Insulations

IV. Airplane Assembly
   A. Materials and standards
   B. Joining, fastening, and safetying
   C. Rigging
   D. Alinement
   E. Engine and instrument installations
   F. Floats, skis, flares, safety belts, heaters, fire extinguishers, etc

V. Inspection
   A. Final inspection and use of forms
   B. Record of all data in logbook

VI. Engine Run-In

VII. Flight Test
Appendix J

AVIATION 160 — AIRCRAFT RIGGING AND ASSEMBLY

Ground Training — 100 classroom hours

I. Explanation of Shop Procedures and Equipment
   A. Care and use of hand tools
   B. Special equipment
   C. Arrangement of parts
   D. Care in handling and cleaning
   E. Rules, regulations, and safety precautions

II. Stresses on Aircraft Structure
   A. Effect of external forces
   B. Kinds of stresses
   C. Design loads

III. Aircraft Materials and Standards
   A. Types of materials
   B. Identification
   C. Application
   D. A. N. specifications

IV. Joining, Fastening, and Safetying
   A. Soldering, welding, riveting, and splicing
   B. Bolts, nuts, and machine screws
   C. Methods of safetying

V. Aircraft Construction Designs
   A. Fuselage structure
   B. Wing structure
   C. Fittings
   D. Empennage
   E. Landing gear

VI. Assembly and Rigging
   A. Principal assemblies
   B. Fuselage
   C. Empennage
   D. Landing gear
   E. Flight and auxiliary controls
   F. Final assembly and alinment
   G. Weight and balance

VII. Inspection
   A. C.A.A. requirements
   B. Inspection of aircraft and use of forms
   C. Drawings and other data required

VIII. Miscellaneous Information
   A. Installation of floats, skis, flares, safety belts, cabin heaters, anti- and de-icing equipment, and fire extinguishers
   B. Maintenance, repair, and inspection
Appendix K
AVIATION 161 — AIRPORT SHOP MANAGEMENT

Ground Training — 54 classroom hours

I. Shop Safety Policies
   A. Safety fundamentals
   B. Personnel protective equipment
   C. Ventilation
   D. Lighting
   E. Fire prevention
   F. Machine shop
   G. Cleanliness

II. Purchasing
   A. Procedure and purchase requisitions
   B. Purchase orders and invoices
   C. Use of inventories in purchasing
   D. Incoming shipments

III. Record Keeping
   A. Need for records
   B. Purchase records
   C. Sales records
   D. Financial records

IV. Filing
   A. Filing devices
   B. Indexing
   C. Filing methods
   D. Using the files

V. Inventories
   A. Purpose of inventories
   B. How inventories are taken
   C. Use of inventories in management

VI. Accounting
   A. Reasons for accounting
   B. Types of accounting records and forms
   C. What accounting records should show
   D. Statements made from records
   E. Comparative statements
   F. Preparation of budgets
VII. Job Estimates
   A. Factors in retail pricing
   B. Retail price fixing
   C. How to figure markup and selling price
   D. Appraisement

VIII. Foremanship
   A. Personnel relations
   B. Industrial relations
   C. Time and motion studies
   D. Supervision techniques

Appendix L

AVIATION 162 — AIRCRAFT SYSTEMS AND APPLIANCES

Ground Training — 100 classroom hours

I. Hydraulic Principles — Laws of hydraulics

II. Basic Hydraulic System (units in system and explanation of purpose of each) — Reservoir power pump, (gear and vane), manual or hand pump, automatic pressure regulator, relief valves, pressure accumulator, pressure gauges, filters, selector valves, actuating cylinders, check valves, lines and fittings, snubbers, and operation of complete system

III. Hydraulic System — Open center and constant pressure systems

IV. Landing Gear
   A. Types
   B. Installations, proper repair procedure, inspection, and C.A.A. repair requirements
   C. Shock absorbing devices

V. Checking, Adjusting, and Inspecting of Hydraulic Systems on Airplanes
   A. Different operating principles
   B. Removal and disassembly
   C. Repair and servicing
   D. Assembly installation and inspection
VI. Fuel Systems
   A. Types
   B. Fuel line installation
   C. Annealing
   D. C.A.A. requirements pertaining to fuel systems
   E. Units in the system
   F. Fuel tanks

VII. Oxygen System
   A. Theory and operation
   B. Different units in the system
   C. Installation and inspection of system
   D. Safety requirements

VIII. Electrical and Lighting Systems
   A. Inverters
   B. Voltage regulators
   C. Batteries
   D. Lights
   E. Flares
   F. Heaters
   G. Actuating motors
   H. Wiring

IX. Radio
   A. Fundamentals
   B. Battery operated receivers and transmitters
   C. Power supplies
   D. Antennas
   E. Shielding
   F. Special installations

X. Instruments
   A. Pressure instruments
   B. Gyro instruments
   C. Electrical instruments
   D. Installations
Appendix M

AVIATION 163 — AIRCRAFT WOODWORKING

Ground Training — 100 classroom hours

I. Identification of Aircraft Woods
   A. Properties and characteristics
   B. Structure of wood
   C. Hardwood and softwood

II. Identification of Lumber
   A. Plain sawed lumber
   B. Quarter sawed lumber
   C. Measuring lumber

III. Treatment of Wood and Lumber
   A. Seasoning of new lumber
   B. Treatment of wood
   C. Inspection for defects

IV. Wood Storage — Importance of proper storage

V. Types Used and Procedure in Gluing
   A. Common types of aircraft glues
   B. The most practical use of each type of glue
   C. Proper gluing procedures

VI. Bending Techniques of Wood
   A. Types of wood suitable for bending
   B. Types of bending commonly done
   C. Precautions in preparing wood for bending
   D. Drying of wood after soaking or steaming

VII. Aircraft Wood Layout
   A. Type of layout encountered
   B. Tools and their proper uses
   C. Laying out airfoils

VIII. Jigs and Templates
   A. Common types of jigs
   B. Important features in jig construction

IX. Identification of Transparent Material
   A. Burring
   B. Flexing
   C. Visual
   D. Checking for acrylic base plastics
   E. Cellulose acetate base plastic

X. Types of Transparent Plastics
XI. Uses of Transparent Plastics
   A. Acrylic plastics
   B. Cellulose acetate base plastics
   C. Acrylic — Vinyl Laminater

XII. Storing and Handling Transparent Sheets
   A. Storage
   B. Handling of transparent sheet

XIII. Installation
   A. Special problems encountered
   B. Causes for buckling
   C. Causes for shrinking
   D. Causes for cracking and glazing

XIV. Cementing of Acrylic Sheets
   A. Terminology of cementing
   B. Types of cements used
   C. Cementing procedure

XV. Finishing of Transparent Sheet
   A. Limitations in use of sanding and buffing
   B. Proper use of ashing
   C. Buffing
   D. Hand polishing
   E. Waxing

XVI. Maintenance of Transparent Sheets
   A. Flushing
   B. Use of soap and water
   C. Drying sheet

XVII. Practical Repairs on Aircraft

Appendix N

AVIATION 165 — AIRCRAFT WELDING

Ground Training — 80 classroom hours

I. Setting Up of Welding Equipment
   A. Regulators
   B. Oxygen and acetylene containers
   C. Torch assembly
   D. Hose

II. Weld Beads
   A. Identification of weld beads
   B. Proper technique for proper beads

III. Selection of Welding Equipment
   A. Tip size
   B. Regulators
IV. Selection of Welding Rod
   A. Purpose of rod
   B. Selecting proper alloy rod
   C. Diameter of rod

V. Proper Preparation of Details for Welding
   A. Cleanliness
   B. Preparation to prevent distortion
   C. Fluxes and their uses
   D. Corrosion prevention
   E. Making butt welds in SAE 1020 and SAE 4130
   F. Making butt weld inclined 45 degree in SAE 4130
   G. Making butt weld in 4130 steel

VI. Interpretation and Identification of Welds
   A. Lack of penetration
   B. Burning of parent metal
   C. Over heating
   D. Under cut beads
   E. Practical application

VII. Design of Welded Joints
   A. Butt welds
   B. Lap welds

VIII. Practical Application of Joint Design
   A. Splicing tubing
   B. Use of lines for added strength
   C. Use of finger plates
   D. Use of gussets

IX. Expansion and Contraction
   A. Definition and explanation
   B. Allowance for expansion and contraction
   C. Effect of improper allowances

X. Jigs and Fixtures — Types of jigs and fixtures

XI. Metallurgy of Welding (Steel)
   A. Effect of carbon in steel
   B. Effect of silicon and manganese in steel
   C. Effect of molybdenum in steel
   D. Effect of elements in welding rod
   E. Effect of oxygen on weld melt

XII. Welding Technique of Aircraft Steels

XIII. Inspection of Welds

XIV. Heat Treatment

XV. Welding Stainless Steel

XVI. Practical Work on Aircraft
Appendix O

AVIATION 167 — AIRCRAFT SHEET METAL

Ground Training — 100 classroom hours

I. Introductory Review of Laboratory and Industrial Shop Procedures
   A. Safe practice in use of hand tools
   B. Safe practice in using power tools
   C. Authorization for use of power equipment
   D. Handling of raw materials and completed parts
   E. Care and maintenance of tools and equipment

II. Template Layout and Development
   A. Nomenclature used in templated development
   B. Methods of flat pattern calculation
   C. Using the empirical formula
   D. Applying the bend allowance to flat pattern

III. Flat Pattern Problems — General tools, equipment, and their use

IV. Sheet Metal Forming, Tools and Methods
   A. Explanation of the mechanical change in sheet materials during the various forming operations (theory of bending)
   B. Simple form blocks
   C. Bar folders
   D. Apron brakes
   E. Rolls
   F. Press brakes
   G. Punch and die forming procedure
   H. Stretch presses and their use

V. Aircraft Riveting
   A. Common types of joints
   B. Common types of riveting and the use of each type
   C. Types of rivets used and identification
   D. Riveting tools, equipment, and their use
   E. Technique of riveting

VI. Mock-ups
   A. Purpose of mock-ups
   B. Types of mock-ups and their uses
   C. Construction of mock-ups
   D. Use of mock-up in making other production tools
   E. Rivet plate using vibrator and bucking bar
VII. Aluminum Alloys
   A. Classification and nomenclature
   B. Protective clad sheets
   C. Commercial products and their uses in airframe structure

VIII. Heat Treating Aluminum Alloy Parts
   A. Types of heat treat possible
   B. Soaking time
   C. Quenching
   D. Rinsing
   E. Age hardening

IX. Aircraft Steels
   A. Types commonly used in aircraft
   B. Purpose and use of steel in aircraft structure
   C. Heat treatment of steel

X. Corrosion in Aluminum, Steel, Magnesium
   A. Types of corrosion in aluminum alloys
   B. Types of corrosion in steel
   C. Forms of corrosion in alloys of magnesium
   D. Identifying corrosion in aircraft materials

XI. Aircraft Sheet Welding (Review)
   A. Types of welding generally used
   B. Weldable aircraft sheet materials
   C. Proper use of various types of welding
   D. Manufacture of parts with proper joints
   E. Inspection of welds and welded joints
   F. Joining with dissimilar alloys

XII. Jigs and Fixtures Used in Manufacture and Assembly of Sheet Metal Components
   A. Type and description of jigs and fixtures
   B. Examination and operation of an assembly jig
   C. Practical designing of assembly jig

XIII. Practical Work on Aircraft
Appendix P

AVIATION 168 — PROBLEMS OF AIRCRAFT MAINTENANCE

Ground Training — 36 classroom hours

Group discussion and reports on current problems of aircraft maintenance.

Appendix Q

AVIATION 170 — AIRCRAFT ELECTRICAL SYSTEMS AND COMPONENTS

Ground Training — 45 classroom hours

I. Sources, Characteristics, and Measurement
   A. Electrical fundamentals
      1. Basic theory — The knowledge of amperes, voltage, watts, Ohms law, resistance, inductance, capacitance, cycles, frequencies, and other electrical terms
      2. Aircraft battery types — Service, installation, and maintenance
      3. Measuring instruments — The knowledge and use of voltmeters, ammeters, Ohmmeters
   B. Electrical equipment — A knowledge of the uses, operation and installation of switches, insulators, rectifiers, condensers, fuses, circuit breakers, relays, rheostats, junction boxes, thermocouples, generating equipment, and motors

II. Transmission of Electricity
   A. Conductors, types of circuits, and methods of control
   B. Load analysis, circuit protection methods, regulators, inverters, voltage dividers

III. Uses of Electricity in Aircraft — Heat, lighting, and power
Appendix R

AVIATION 171 — AIRCRAFT FINISHING METHODS

Ground Training — 100 classroom hours

I. Fabric Layout
   A. Identification of fabric
   B. Measurements
   C. Direction of seams
   D. Cutting practices
   E. Blankets, socks, and boots
   F. Wing, fuselage, and tail group layouts
   G. Operation of sewing machine

II. Applying Fabric
   A. Preparation before covering
   B. Protective coatings
   C. C.A.A. inspection before covering
   D. Methods of fitting cover
   E. Sewing and trimming
   F. Location and types of seams
   G. Attachment of fabric to structure
   H. Drain grommets, purpose and applications

III. Rib Stitching
   A. Types of knots
   B. Size of cord
   C. Spacing and location

IV. Doping
   A. Dope and paint room layout
   B. Proper equipment
   C. Ventilation, heating, and humidity control
   D. Electrical and safety precautions
   E. Composition of dope, lacquer, and enamels
   F. Types of thinner
   G. Mixing of dope
   H. Protective coatings, purpose and types
      I. Brushing dope
      J. Doping procedure
      K. Applying of finishing tape
      L. Storing of dope
      M. Rejuvenating fabric
      N. Testing fabric
V. Spray Painting
   A. Use of equipment
   B. Spray gun troubles
   C. Spray applications of primer and dope
   D. Drying and blushing
   E. Wet sanding
   F. Types of finishing

VI. Lettering
   A. C.A.A. requirements
   B. Colors used
   C. Masking and spraying

VII. Patching Fabric
   A. Methods
   B. Preparation of old fabric
   C. C.A.A. requirements
   D. Fire prevention

VIII. Protective Coatings for Aircraft
   A. Metal finishing
   B. Wood finishing
   C. Plastic finishing
Appendix S

AVIATION 173 — AIRCRAFT RADIO AND INSTRUMENTS

Ground Training — 36 classroom hours

I. Radio Installation and Inspection
   A. Federal Communication Commission regulations pertaining
      to installation and operation of two-way radio
   B. Shock panel installation
   C. Methods of connecting leads
   D. Methods of insulating all wiring
   E. Reading of wiring diagrams
   F. Antenna installation
   G. Use of shielding and bonding

II. Instrument Installation and Inspection
   A. Instrument panel layout and installation
   B. Construction of instruments
   C. Operation
   D. Line inspection of engine and flight instruments
# Appendix T

The following charts are employed by the A.M.C. department as "trial" registration forms.

## FIRST YEAR — 1st Semester Sec. A, B, and C

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## FIRST YEAR — 2nd Semester, Sec. A, B, and C

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**Remarks:**
- 8-Drill
- 9-Theory
- 9-Theory

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**COD YEAR — 1st Semester, Sec. A and B**

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**COD YEAR — 2nd Semester, Sec. A and B**

Circle the section you select.
# Appendix U

## Mechanic School Application and Inspection Report

**Note:** Application on reverse side of this form

### Inspection Report

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(Aviation Safety Agent)

### Application and Inspection Report

1. **Name of School**
2. **Address**

### Courses Given in Accordance with Civil Air Regulations

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<td>C. Engine</td>
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### Questions

4. Does the present course of study meet the requirements of CAR 53 and CAM 53? **YES**

5. Is the course of study considered up-to-date and adequate for current requirements?

6. Is the instruction personnel competent and properly certificated?

7. Does the school have sufficient instructional aids for all phases of training?

8. Does the applicant operate an aircraft and/or engine-repair station?
   a. Does the school have sufficient classroom and shop areas separate from the repair station?
   b. Are students thoroughly trained in fundamentals before permitted to do practical work in repair station?

9. Do all students have an opportunity to do practical overhaul work on live equipment before graduation?

10. Do facilities, equipment, and records meet current minimum requirements of CAR 53 and CAM 53?

11. Is required equipment in possession of school conveniently located for training purposes?

12. Are necessary materials, supplies, and tools available for training and proper storage facilities provided?

13. Are classrooms and shop space adequate for courses given?

14. Are classrooms and shops properly equipped, heated, lighted, and ventilated?

15. Have proper safety measures been taken to insure adequate protection of students operating dangerous equipment, including engine test stands?

16. Are classrooms and shop areas sufficiently clean and orderly to show evidence of good housekeeping?

17. Does the school offer full cooperation with respect to examinations, inspections, reports, and other requirements?

18. Do school records indicate that at least 80 percent of graduates who take CAA written and practical examinations on completion of course are successful on first attempt?

19. Are school's mechanic examiners maintaining satisfactory standards and records on CAA practical examinations?

### Facility Details

- **Total number of hours of training per day:**
  - Per student, exclusive of rest and lunch periods

- **Approximate number of square feet of space used for training:**

- **Present enrollment of school:**

- **Date curriculum now in use approved and sealed:**

### General Ability

24. Give your estimate of the school as to its general ability to satisfactorily function as a certified mechanic school.
MARKS: INCLUDE ANY RECOMMENDATIONS THAT YOU MADE FOR IMPROVING THE SCHOOL. IF A LETTER WAS SENT POINTING OUT DEFICIENCIES, ATTACH A COPY. (IF ADDITIONAL SPACE IS NEEDED, CONTINUE ON SEPARATE SHEET OF PAPER.)

APPLICATION FOR MECHANIC SCHOOL CERTIFICATE AND RATING

<table>
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1. TYPE(S) APPLIED FOR

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<td>YES</td>
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2. Do the present classrooms, shop space, facilities, equipment, and materials meet the requirements of Part 53 of the Civil Air Regulations?

3. Are three (3) copies attached of a list of instructors giving type, number, and ratings of their certificates and subjects to be taught?

4. Are four (4) copies attached of all proposed curriculums for which approval is requested?

5. Are three (3) copies attached of an inventory of facilities, equipment, and materials used by the school?

6. What is the present enrollment of the school?

7. What is the contemplated enrollment of the school?

CERTIFICATION.—I CERTIFY THAT THE STATEMENTS MADE ABOVE, AND THE STATEMENTS MADE IN ANY ATTACHMENTS HERETO ARE CORRECT AND TRUE.

(DATE) (SIGNATURE OF APPLICANT) (TITLE)
References

The Government Printing Office has many good books available through the Superintendent of Documents, Government Printing Office Washington 25, D.C. These books are Navy training courses and cost 75 cents each.

Also, through the Superintendent of Documents, it will be necessary to buy the required C.A.A. parts and manuals necessary to meet the requirements in the proposed curriculum. They are: Parts 1, 2, 3, 4a, 4t, 5, 6, 7, 8, 9, 13, 14, 18, 24, 43, 52, and 62. The manuals needed are 14, 18, and 53.

The Institute of Aviation has found that the best source of information is contained in the manuals and bulletins published by the manufacturer of the item.

The Institute of Aviation library contains many manuals from:

- Aeronca Aircraft
- Beech Aircraft
- Bendix Scintilla
- Bendix Stromberg
- Boeing Aircraft
- Cessna Aircraft
- Champion Spark Plugs
- Continental Motors
- Curtiss Propellers
- Douglas Aircraft
- Franklin Air Cooled Motors
- Hamilton Standard
- Jacobs Aircraft Corporation
- Lycoming
- Martin Aircraft
- Navion Aircraft
- Pratt and Whitney
- Wright Aviation

There are many other manufacturers who are very cooperative in supplying instructional material either at a nominal fee or often gratis.
THE INSTITUTE OF AVIATION, established in 1945 as the Institute of Aeronautics, is operated as the administrative agency responsible for the fostering and correlation of the educational and research activities related to aviation in all parts of the University. Other functions include academic instruction, flight training, management of the University of Illinois Airport, and aeronautical research.

In connection with the latter function, the Institute issues two types of publications . . . first, a group of reports on research results, and second, a series of bulletins on aviation subjects of an extension-service nature to the citizens of the State.

The following publications have been issued:

**BULLETIN ONE:** Municipal Airport Management, Leslie A. Bryan, 1947. (Out of print)

**BULLETIN TWO:** Landscape Planting for Airports, Florence B. Robinson, 1948.

**BULLETIN THREE:** Labor Relations in the Air Transport Industry Under the Amended Railway Labor Act, E. B. McNatt, 1948.

**BULLETIN FOUR:** Airport Zoning, J. Nelson Young, 1948. (Out of print)

**BULLETIN FIVE:** Evaluation of the School Link as an Aid in Primary Flight Instruction, A. C. Williams, Jr. and Ralph E. Flexman, 1949.

**BULLETIN SIX:** Lightplane Tires on Turf and Concrete, Leslie A. Bryan, 1949.

**BULLETIN SEVEN:** Light Aircraft Operating Costs, Leslie A. Bryan, 1949.

**BULLETIN EIGHT:** Evaluation of the School Link and Special Methods of Instruction in a Ten-Hour Private Pilot Flight-Training Program, Ralph E. Flexman, William G. Matheny, and Edward L. Brown, 1950. (Out of print)


**BULLETIN TEN:** Operating Costs of a Light Aircraft Fleet, Leslie A. Bryan, 1952.

**BULLETIN ELEVEN:** 180-Degree Turn Experiment, Leslie A. Bryan, Jesse W. Stonecipher, and Karl Aron, 1954.

**BULLETIN TWELVE:** Aviation Ground School, Leslie A. Bryan, 1954.

**BULLETIN THIRTEEN:** Organizing for Flight Operations, Leslie A. Bryan, 1954.

**BULLETIN FOURTEEN:** Developing an Aircraft Maintenance Curriculum, Leslie A. Bryan, 1955.

Publications of the Institute of Aviation will be sent free of charge upon request.