Aircraft Construction and Restoration Course

Washburn
Originally Created by: Peter Denny (9/23/2004)
Content Area: Aviation and Aerospace/CTE Grade Level: 101112
Last modified: 3/24/2005 5:34:42 PM
Unique Map ID: 4
Year Long Map ID: <file:///A:/FMPro%3F-db=washburn.fp5%26-format=print.html%26-lay=Maps%26MapID=%26-find>

Abstract: This is a one semester course in which students will actually be engaged in the building of an all metal kit airplane. The students will build from plans and by kit in partnership with mentors of the Minneapolis chapter of the Experimental Aircraft Association and technicians from North West Airlines. The students will build the fuselage, wings and empennage (tail); and install wiring for the instrument panel and engine monitoring systems. Students will install the engine. Students will also study the principles of aeronautics, internal combustion engines, electrical and hydraulics, along with the science of flight which is an integral part of this course. Upon completion, this airplane will be presented to the Federal Aviation Administration (FAA) for inspection and approval for flight. This course will be the prelude to articulation into associated courses at aviation training centers, for example MCTC Flying Cloud. This one semester course will be continuous until the completion of the airplane.
Dates: -

Enduring Understandings

Custom aircraft building is one of the primary forms of recreational flying in the world today. Many people have successfully built and flown their own aircraft. As of the year 2004, 25,000 aircraft are currently registered as "homebuilt". In 1947 individuals were first allowed to build their own airplane and have it certificated for flight by the FAA. In 1953, Paul Poberezny founded the Experimental Aircraft Association (EAA). As a point of interest, in 1903 Orville and Wilber Wright were considered to be the first airplane "homebuilders".

Standards

ID	Standards	Benchmarks

The three standards mentioned above, Technical Reading, Technical Writing and New Product Development are all imbedded into the curriculum. They are stand alone assessment instruments. However, assessment of the above standards are a major focal point of the overall assessment

Essential Questions

1. Why do people desire to build their own airplane?
2. How do people develop this interest and how do they get started in the process?
3. How do you choose a medium to build in?
4. What workspace, tools and equipment are required?
5. What skills are needed?
6. How much time and money will this project take?
7. Will I make a financial return for my investment?
8. How do I finally choose a design?
9. Do I build from Plans, Kit or do I design and build my own?
10. What about ongoing inspections?
11. What decisions should I make regarding engine and instruments?
12. What about painting and finishing?
13. Does the FAA impose any restrictions on flying my homebuilt?
14. What licenses do I need to fly my plane?
15. Can I do my own repairs after the plane has been inspected?

Concepts

Students will require a sound knowledge and understanding of the following concepts.

1. Workshop Safety
2. A sound knowledge of aircraft components and aerodynamics.
3. To be able to read a working blue print. Have knowledge of "Title blocks", "View Types", "Line Types", "special symbols" associated with the aviation industry.
4. The student should have a basic understanding on why an airplane must be in balance.
5. Students will develop an appreciation of the publications out there that will help them build their airplane.
6. Students will become obtain the necessary mathematical skills necessary to make ongoing calculations during the building process.

These being:

Demonstrate problem solving skills, use a calculator, compute whole numbers, compute fraction problems, compute complex numbers, perform fraction conversions, perform decimal conversions, solve decimal application problems, perform percent conversions, round decimal numbers, compute perimeter, compute circumference, categorize angles, compute volume, calculate surface area, solve geometry problems, perform metric to English conversions, perform English to metric conversions.

The student will acquire proficient skills in sheet metal fabrication, repairs, understanding of loads and stressing.

The student will be able to identify and select the correct fastener, including "Cherry Pops", solid rivets both countersink and universal.

The students will also develop the skills in selecting the correct tool for the application and to use it safely.

Skills

1. Students will demonstrate professional safe practices as demanded by the aviation industry.
2. Students will be able to identify major and minor parts of an aircraft as well as to be able to explain their function.

3.Students will be able to work and glean relevant information from a number of aircraft plains. The student will also be able to interpret system schematics.
4. Students will demonstrate weight and balance calculations, and to establish Datum reference points.
5. Students will draw information from a number of journals and publications.
6. Students will be required to demonstrate sketching, dimensioning of aircraft parts.
7.Students will be able to demonstrate ability to read, comprehend and apply information contained in FAA and manufacturers aircraft maintenance specifications, date sheets, manuals relating to "AD's", Regulations (Current) and advisory circulars.
8. The student will be able to inspect and repair structures,
9. Install universal and countersink rivets.
10.Pull "POPS"
11.Form, layout and bend flat sheet aluminum.
12. Select, install, and remove special fasteners for metallic, bonded, and composite structures.
13. Select twist drills.
14. Select and use a hand file for soft metals.
15. Describe the construction characteristics of airframe structures.
16. Describe the types of loads carried by wing spars.
17. Drill holes with an accuracy of plus or minus 1/16 of an inch.
18. Countersink and dimple a hole to receive a rivet.
19. Select correct rivets, calculate correct length and edge distance.
20. Demonstrate proper riveting techniques.
21. Stop drill cracks in sheet aluminum.
22. polish filed edges.
23. Prepare sheet metal for flush rivets.
24. Select bucking bars, and perform a solid riveting task.
25. Remove rivets.
26. Adjust and operate air riveting equipment.
27. Install blind rivets.
28. Demonstrate bend radius.
29. Bend sheet material to a specified angle.
30. Identify "Grain" in Material
31.Determine flat dimensions on a layout.

Summative Assessment

Title:

Description:

Title:
Aircraft Research Assignment

Description:
The student is to research and report back to the group of his/her findings on a airplane of choice he or she would love to build and own. This project must focus on an airplane not built of metal.
The student is to produce a colorful wall chart. A written four page report will be submitted also.

Formative Instruction/Assessments

Assessment #1.
a) The students will be given two blueprints. The student will identify each different line and type of information included on the blueprints.
b) Students will be required to demonstrate the correct use of charts and graphs.
c) The students will be required to answer worksheets on the Sonex, materials, tools and fasteners.
d) A final exam focusing on what was covered throughout the semester.
e) Ongoing evaluation of practical workmanship, team skills and safety practices.
Assessment #2
Students will work in pairs, markout, layout the set exercise.
The students will demonstrate the necessary skills mentioned under "Skills"
The project is an introductory exercise from the Sonex factory.
Assessment #3
The class will be broken up into the following groups:
Tail Group
Wing Group
Rear Fuselage Group
Front Fuselage Group.
Students practical skills will be assessed both my the teacher and the mentors. The student's grade will be determined as a group.

Differentiation

It will be important to recognize early in the semester those students needing assistance with language. It may be necessary to obtain a reader for the student(s) during the testing phase.

Academic Language

Trade language and necessary terminology.

Resources

"Sportplane Builder" by Tony Bigelis
EAA "Technical Advisor" Manuals
The "FAR" Parts 1 through 183
Advisory Circulars 20-62 to 65-11
Curriculum Guides Airframe and Power Plant MCTC.
Selected manuals and Journals

www.sonexaircraft.com Sonex Aircraft
www.eaa.org Experimental Aircraft Association
www.sun-n-fun.org Sun and Fun Fly-In
www.usjabiru.com Jabiru engines

Additions

Approval to build this airplane has been solely issued to me Peter Robert Denny on the 30th May, 2003. The articles of agreement was issued by Sonex Ltd.

I am a member of the EAA, I have previously built a complex all metal RV6 airplane in Australia. I am also a designated Technical Counselor, with the authority to inspect workmanship by home builders in Minnesota.