E15: Introduction to Aviation

Syllabus

Summer 2025

Teaching Team

Professor: Prof. David Harris Parsons 2374
Proctor: Evelyn Harris

Schedule

Lecture/Lab: Monday-Thursday 6:30-9:30 pm Parsons 1287 and HMC MakerSpace

Electronic Communication

Class web page: http://pages.hmc.edu/harris/class/e15
Class email list:

Course Objectives

In this course, you will learn about aviation and about building an experimental aircraft. At a meta-level, you'll also practice teamwork and leadership, machine shop practices, and hands-on problem solving.

Safety must be foremost. You must have passed the HMC Shop Safety Test before working on this project. Always wear safety glasses while in the AeroLab. Pause work if anyone without glasses approaches your workspace. Beware of sharp edges and pinch points. Be especially careful of tools with rotating cutting wheels including angle and die grinders and the Dremel cutter. Take your work to the appropriate facility when necessary. Go to the metal shop to use grinding or cutting wheels, the bandsaw, and other tools that make metal dust. Go to the paint booth for painting and adhesives that emit fumes. Go to the composites room for composite work. If an injury takes place, notify the instructor immediately. First aid supplies are in the Maker Space.

You need your own set of safety glasses. You may use the glasses issued to you during E4. If you didn't get a set or no longer have it, you may stop by the Machine Shop and request a pair from Drew Price. Label your glasses with your name and don't share them with others. If you prefer to bring your own favorite safety glasses, they must meet ANSI Z87.1.

Quality of work is far more important than speed. My life will depend on the proper assembly of the aircraft. Read each section of the instructions carefully before doing the work. Take the time to properly debur every hole and edge. Be rigorous about maintaining edge clearances for all holes. Refer to Section V of the Vans instructions as needed to review general fabrication

practices. You are working in pairs foremost to have two sets of eyes on each step; check each other, and speak with one of the instructors/proctors if you are unsure. If you are uncertain about another team's practices, speak with them promptly. Aluminum is cheap; if you damage a part and it cannot easily be repaired, let the instructor know and we will order a replacement.

Building an airplane is awesome! Enjoy the opportunity!

The Airplane

We are building a Vans RV12is Experimental Light Sport Aircraft (ELSA). It will carry two people and baggage at about 120 miles per hour for up to 4 hours. The 100 horsepower Rotax engine is very efficient, achieving about 30 miles to the gallon. The planes are known to be delightful to fly, leading to the famous "RV Grin." Vans is the leading maker of experimental aircraft kits, with over 10,000 sold. More than 500 Vans aircraft are completed each year, as compared to about 1300 piston aircraft sold annually worldwide by all manufacturers combined. The RV12is is notable for being relatively easy to build because of its complete kit, CNC match-drilled parts, and comprehensive instructions.

Vans estimates an experienced builder can complete an RV12 in about 800 hours. High school Eagles Nest groups have built these planes in 1-2 years working daily with a large group of students. We expect the HMC Aero Lab build will take at least 3 years.

Upon completion, the instructor expects to take it through Phase I testing.

Readings

The readings are listed on the schedule below and should be completed before the class session. All readings are linked to the class web page. Before Session 1, read the introductory material in the Vans plans, with special attention to Section 5 on General Information about aircraft fabrication. You and your partner will be assigned to a specific section of the construction. Before subsequent class sessions, carefully read that section of plans, watch the Homebuilt Help video for that section, visualize the steps, and identify questions you may have.

If you have a strong interest in aviation, you are encouraged but not required to spend an additional hour each week on further reading. If you may want to learn to fly, read the free FAA *Pilot's Handbook of Aeronautical Knowledge*, and then the *Airplane Flying Handbook*. If you are interested in building or maintaining aerospace systems, browse through *AC43.13-1B Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair*.

HMC also has a non-certified flight simulator in the Engineering Computational Facility. You're encouraged to spend some time on it to explore maneuvers, takeoffs, and landings.

If You Want to Learn to Fly

HMC historically offered the Bates Aviation Program, in which many Mudders learned to become pilots in command, in airplanes and in life. Our alumni include astronauts Stan Love and George "Pinky Nelson" and many pilots and aeronautical engineers. College insurance no longer covers flying instruction, but you can still learn to fly on your own.

To become a private pilot, you must pass a written knowledge test, obtain an FAA medical certificate, complete at least 40 hours of flight training, and pass a checkride with an examiner. Private pilots can carry passengers but not fly for profit. Many pilots go on to advanced certificates, such as an instrument rating, multiengine rating, or commercial license. If you have potential health issues, see the aviation medical examiner first to make sure you qualify for your medical certificate. I have gone to Dr. John Phillip in Glendora.

Although you don't have to pass the knowledge test before you start flight training, your training will be faster and more cost-effective if you do. You can attend ground school classes or take a video course or self-study from a book. Many Mudders are good at learning independently and can quickly and inexpensively prepare by reading. This class will cover some of the aviation topics to whet your appetite, and you can learn the rest from the recommended readings. The Airplane Owners and Pilots Association (AOPA) offers a free 6-month student membership including Flight Training Magazine and many videos.

There are many flight schools, including two at nearby Cable Airport and the Caltech Flight Club at El Monte Airport. You'll learn best if you can schedule two 2-hour blocks a week, which will give you about 2 hours of flight time a week. At this pace, it typically takes about 6 months and $6-10k to complete your private pilot training and check ride. Some people have completed their license in a summer training intensively.

Attendance & Grading

Most of the learning in this class will take place in person, so attendance is expected. If you are ill, fatigued, or otherwise impaired to be working safely in the shop, you are excused and should use the time to rest. You may miss at most one other class session for unavoidable conflicts such as a job interview or Clinic travel.

Each person in the class will take a week to be responsible for the Build Log. During your week, circulate around the different teams, learn what they are working on, and take photos. Upload them to the Build Log on the class web page, and write a paragraph about the work completed that week. Log the hours spent by each person in the class in the Time Tracking spreadsheet. Engaging photos are likely to appear in future reports and stories about the project.

This class has no exams or homework. To receive an A in this class, you are expected to attend as above, participate to the best of your ability, and do the readings/videos ahead of class.

Accommodations

HMC is committed to providing an inclusive learning environment and support for all students. As we return to in-person instruction, we recognize that the challenges facing students may be different and student accommodation needs may change. Students with a disability (including mental health, chronic or temporary medical conditions) who may need accommodations to fully participate in this class are encouraged to contact the Office of Accessible Education at access@g.hmc.edu to request accommodations. Students from the other Claremont Colleges should contact their home college's Accessible Education officer.

Draft Schedule

We will meet in Shanahan in early weeks for topics on fabrication and aviation topics, then move to the Maker Space to build. A tentative listing of topics is given below.

Session	Date	Topic	Readings
0	5/27	Introduction	
1	5/28	Sheet Metal & Fasteners	Plans Sections 1-3, 5
2	5/29	Nutplates, Fluid fittings, tubing	Review plans & videos
3	6/2	Fiberglass & Acrylic	
4	6/3	Flight Simulator	
5	6/4	Aircraft & Pilot Certification	
6	6/5		
7	6/9		
8	6/10		
9	6/11		
10	6/12	Last Day of Class	