MnSGC “Remote High-Power Rocketry Lessons” Fall 2017

Instructor: James Flaten, MnSGC/U of MN, [flate001@umn.edu](mailto:flate001@umn.edu), 651-399-2423 (cell)

Teaching Assistant: Danny Toth, U of MN, [tothx051@umn.edu](mailto:tothx051@umn.edu), 952-649-0558 (cell)

Lesson 1 – Kick-off (North Branch), Sept. 9, 2017, 10 a.m. till ~1 p.m., Tripoli MN club launch

* Project overview and get team tote, see examples of model and high-power rockets (including cut-away models), build and fly a model rocket (possibly on two different motors) with borrowed Altimeter Two data logger, observe high-power rockets being launched, select time slot for weekly remote lesson and (maybe) a TA call-in time
* Homework: recruit additional team members, go through tote looking for any missing items, practice videoconferencing with Danny

Lesson 2 –Rocketry Concepts; Parts of the Kit; Epoxy Practice, Sept. 19, 2017, noon to 1 p.m.

* Rocket vocabulary and basic concepts (including “dual deploy”), calculating CG, CP, and SM (by hand), types of epoxy (kit comes with some, but not all), step through all contents of tote (more than just rocket parts), assemble rocket cradle, talk through template for Flight Readiness Review (written report)
* Homework: find (and occupy) a build space, fin-can exercise (epoxy practice)

Lesson 3 – Building the Airframe (this will take more than one week), Sept. 26, 2017, noon…

* Dry-fit airframe parts, scuff surfaces before applying epoxy or paint, advice about building the motor-mount assembly (order is critical here) and motor retainer, advice for applying epoxy to fins (i.e. feedback on fin-can exercise), modify nosecone for forged eyebolt and to accommodate radio beeper (will require Dremel or similar tool), discuss when to use friction fit vs shear pins vs rivets, how to attach recovery harness to rocket parts, how to attach parachutes and flame protectors to recovery harness, how to build a piston ejection system
* Homework: make an explicit build schedule that takes into account epoxy and paint drying times then stick to it, start to build the airframe – complete it within 3 weeks (at the very latest)

Lesson 4 – Simulating Performance, Oct. 3, 2017, noon to 1 p.m.

* RockSim vs OpenRocket, learn how to edit (or make from scratch) an electronic model in OpenRocket, how to launch it with various motors under various wind conditions, where to get weather conditions for North Branch flying field, get default/basic electronic model
* Homework: play with simulation software, improve the basic electronic model (provided) for your kit rocket, simulate its performance with a Cesaroni I-170 motor under varying wind conditions, continue building airframe

Lesson 5 – Building/Wiring the Av-Bay; Programming the Altimeter, Oct. 10, 2017, noon…

* Dry-fit av-bay parts, plan where to place internal components and how to secure them to the sled, calculate appropriate vent hole size for av-bay, practice graphing flight data and interpreting it, learn to use Altimeter 3 device and plan how to mount in the rocket
* Homework: build a removable av-bay, wire the components, add switch access hole, add additional vent hole(s) (if necessary), program the altimeter, practice turning it on inside a sealed av-bay, finish building the airframe, mount Altimeter 3, learn to operate it

Lesson 6 – Finishing the Rocket, Oct. 17, 2017, noon to 1 p.m.

* Advice about priming and painting the rocket, add bleed holes as need be
* Homework: prime and paint the rocket (allowing sufficient drying time between coats), finish and submit written Flight Readiness Review/Report

Lesson 7 – Flight Readiness Review and Safety Check (probably done with teams individually), possibly spread over the weeks of Oct. 24 and Oct. 31

* Show rocket to instructor and TA by videocon (essentially go through your FRR orally), field any questions, especially about safety
* Homework: finish anything not yet done, address issues raised in the FRR/Safety Check

Lesson 8 – Flight (North Branch), Nov. 4, 2017 (tentative), 10 a.m. till ~3 p.m., private launch

* Arrive with fully-completed rocket, do ejection charge testing (with parachutes and av-bay sled out of rocket, but shear pins and rivets as for flight), test the altimeter (outside of the rocket), learn to fold parachutes and install them, learn to operate video cameras and insert them, learn to operate radio beepers and insert them, install motor and verify actual weight and CM and CP and SM (then add weight to nose cone if need be), re-load the ejection charges and put av-bay back in rocket, finalize shear pins and rivets and friction fit, launch then recover the rocket, download and look at flight data on the spot
* Homework: look at flight data and discuss rocket performance, decide whether or not to continue into a rocketry competition: if so, start planning – if not, return all removable parts (but you may keep the airframe regardless)